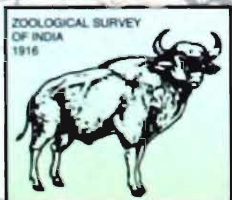
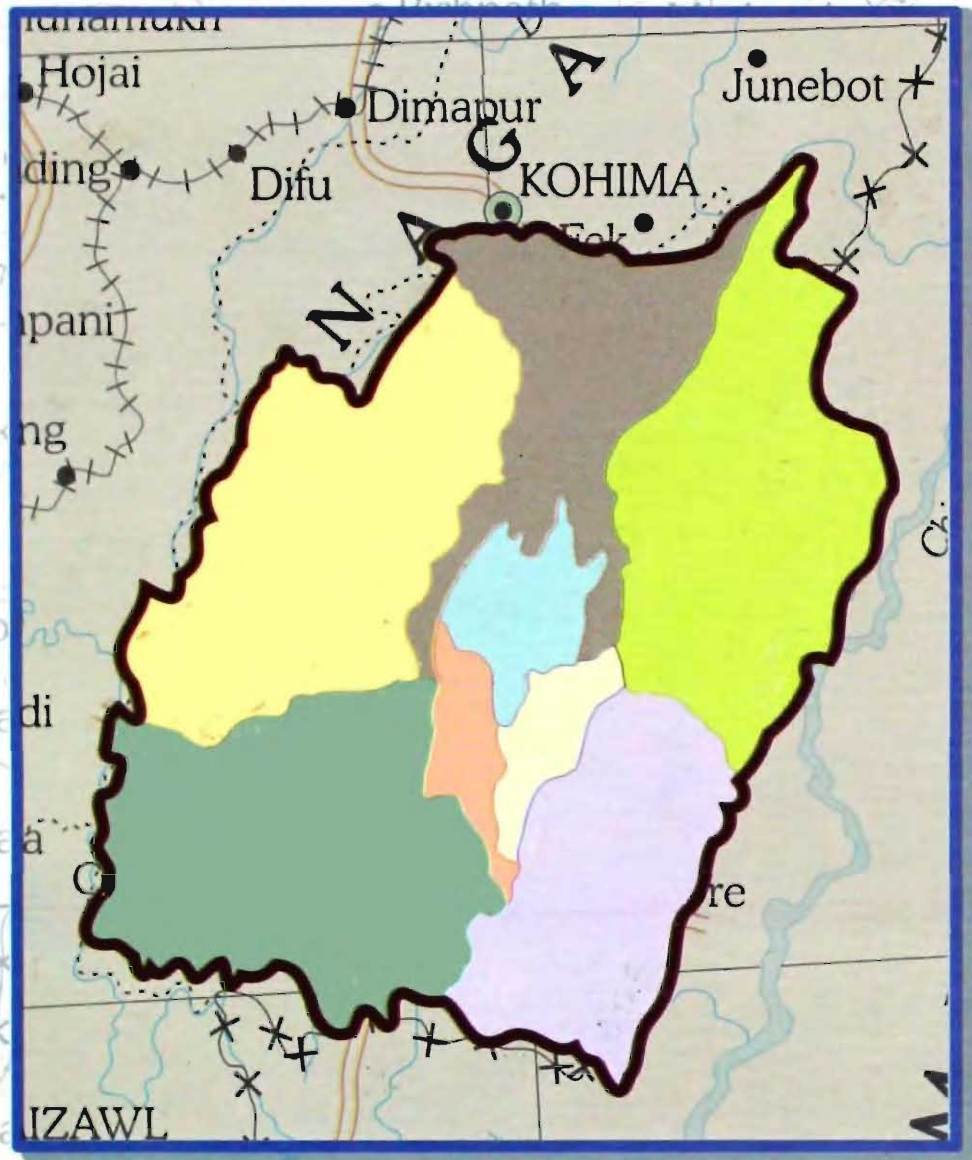


FAUNA OF MANIPUR

PART - 1 (Vertebrates and Animal Fossils)



FAUNA OF MANIPUR

(PART-1)

Vertebrates and Animal Fossils

*Edited by
The Director, Zoological Survey of India, Kolkata*



**Zoological Survey of India
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FAUNA OF MANIPUR : AN OVERVIEW

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INTRODUCTION

Manipur literally means 'the jeweled land'. Folklore says the gods created this realm on earth to dance in abandon. The state is often described as "*Switzerland of the East*" with its cascading rapids, tripping rivers, carpet of flowers, exotic blooms and lakes. Having a varied and proud history from the earliest times, Manipur came under the British Rule as a Princely State after the defeat in the Anglo-Manipuri War of 1891. After independence of India, the Princely State of Manipur was merged in the Indian Union on October 15, 1949 and became a full-fledged State of India on the 21st January, 1972.

GEOGRAPHICAL LOCATION

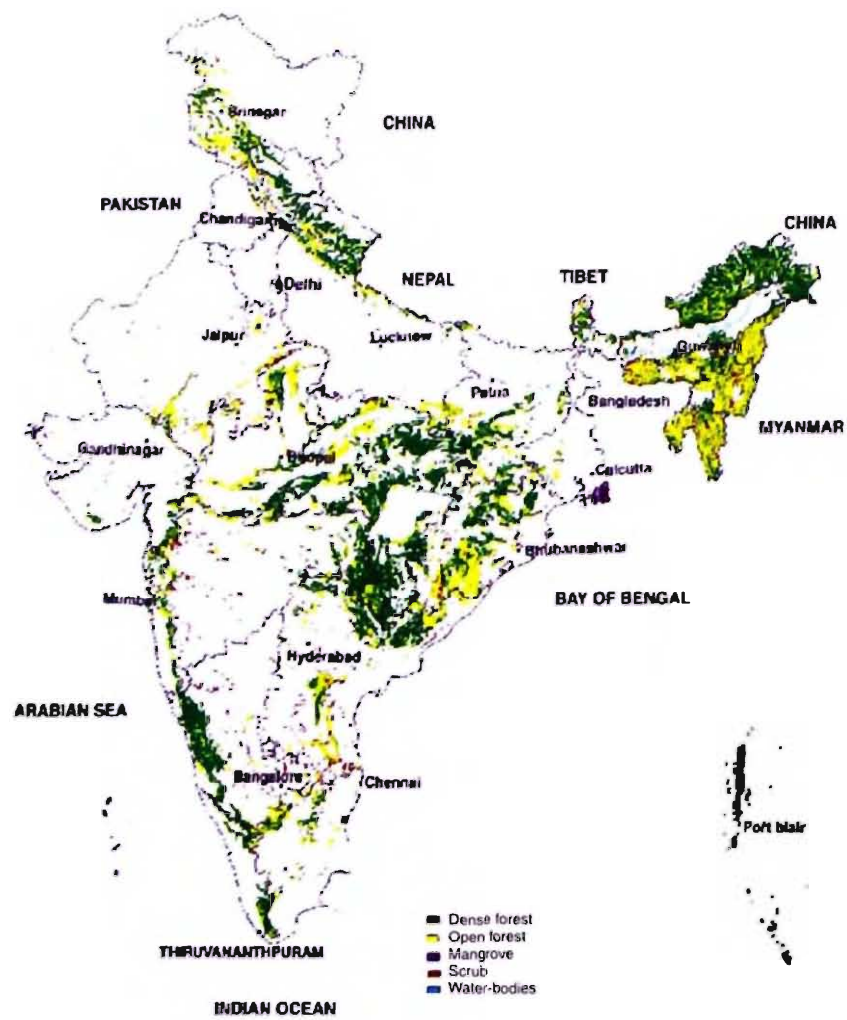
The state of Manipur located in the North-Eastern part of India, bounded by Nagaland on the north, Assam on the west, Mizoram on the south and along the east, shares a long international boundary (352 Km.) with Myanmar. Situated between latitudes 23° 03' N to 25° 03' N and longitudes 93° 03' E to 94° 03' E, Manipur covers a total geographical area of 22,327 Sq Km (8,620 sq m) of which, about nine-tenths constitute the hills surrounding the remaining one-tenth valley. These hills have altitudes ranging from 833 m to 3017 m above MSL, the highest being 2985 m (9843 ft, Cach Phung) in the north. Geographically, Manipur is divided into mountainous hill ranges running north-south abridging the Patkoi Hill range and the Lushai Hill range of the extended Arakan Yoma, and a central plain—the valley of Imphal roughly 48.27

km long and 31.18 km wide. The hills have an average height of 1,300 m (5,000 ft.); the valley, 660 m (2,500 ft) above sea level. The valley is the most densely populated area of Manipur. At its center, is the largest freshwater lake (*Lake Loktak*) in the north-east, covering an area of about 104 km²

The population of Manipur is 23,88,634, with 12,07,338 males and 11,81,296 females (Census – 2001 Provisional), giving an average density of 107 people per sq km. Imphal, one of the oldest state capitals of India, has a population of about 2,00,600. More than 60 per cent of Manipur's population belongs to the Meitei ethnic groups, who are predominantly Vaishnavite Hindus and live in the central valley. The remaining third of Manipuris belong to one of 30 hill tribes.

SOIL AND CLIMATE

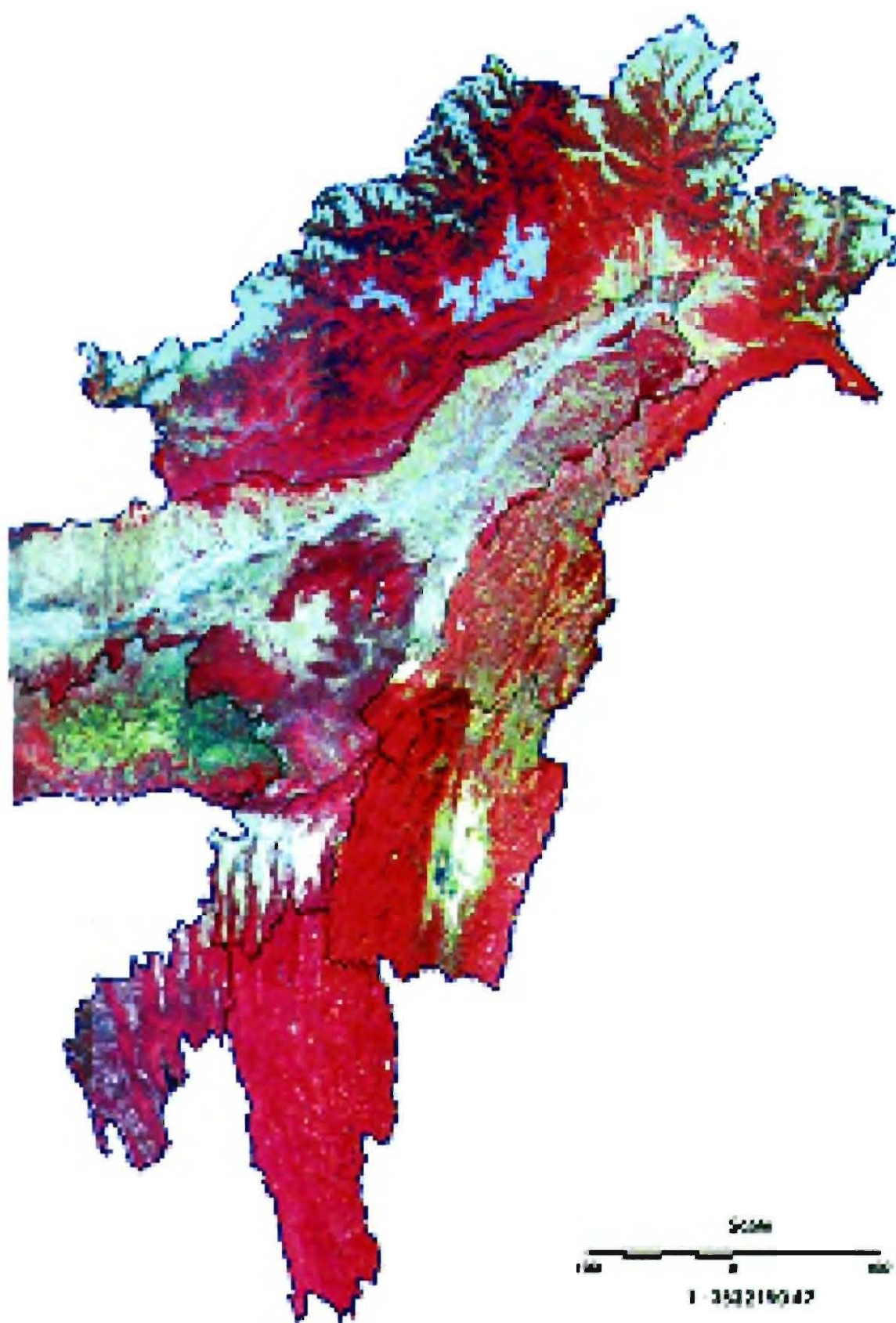
The soil cover can be divided into two broad types, viz. the red ferrogenous soil in the hill area and the alluvium in the valley. The soil generally contains small rock fragments, sand and sandy clay and other varieties, therefore, do not hold water. The topsoil on the steep slopes is very thin. In the plain areas, especially flood plains and deltas, the soil is of considerable thickness. Soil on the steep hill slopes is subjected to high erosion resulting into formation of sheets and gullies and barren rock slopes. Perpetual burning of vegetation due to shifting cultivation, in some parts of the hills, has rendered the soil devoid of humus. The soil from the central plain are greatly



Forest Cover Map of India-A satellite view



Map of Manipur showing different districts



Satellite view of North east States of India

transported from the surrounding hills through rains and contain high proportion of clay. The normal pH value is acidic ranging from 5.4 to 6.8.

The state of Manipur enjoys a typical monsoon climate with variants ranging from tropical to temporal conditions. The state is divided into four climatic zones, *e.g.* Tropical climate in regions comprising valley and hills up to 900 m above MSL with an annual rainfall varying from 157.48 cm to 396.24 cm. This covers Tamenglong, Jiri and Moreh. Montane sub-tropical climatic zone between altitudes 900-1800 m with annual rainfall of about 220 cm covering Chapikarong, Chandel, Sugnu, Nongmaijing, Koubru, Laimaton. Montane temperate Climatic zone, ranging from 1800 to 2400 m with high rainfall and with mean minimum temperature of 3 degree centigrade. Lastly Sub-alpine climatic zone, above 2400m including Siroi, Koubru, Somra and other hill ranges above 2400 m. Manipur receives heavy rainfall from the SW and NE monsoons; records of variable rainfall from year to year, 982 mm in 1992, up to 1981 mm in 1991, the average being 1432 mm. The summer temperature is as high as 39 degree centigrade in Imphal and the winter as low as 0 Centigrade.

PHYSIOGRAPHY

Manipur is geographically divided into two distinct tracts—hills and plains. Manipur's hill ranges form parts of the Indo-Burmese Mountain arc, often referred to as the eastern arm of the Himalayas. Though predominantly a hill state, it is watered by the rivers Imphal, Iril, Thoubal, Irang and Barak, which flow from north to south. At its centre is Lake Loktak into which several rivers drain. There are other lakes in the central area. The Loktak multi-purpose project completed in 1982, has made an impact on the economic development of north-eastern India, especially Manipur.

The State of Manipur, enjoys two major river basins, *viz.* the Barak River Basin and the Manipur River Basin. The total water resources of the two

basins have been estimated to be 1.8487 million hectare metre in the form of annual yield. The Barak river originates from the northern hills and is joined by a number of tributaries such as Irang, Maku, Tuivai, Jiri etc. and thereafter enters Cachar District of Assam. The Manipur river basin has eight major rivers *viz.*, Imphal, Iril, Nambul, Herok, Sekmai, Chakpi, Thoubal and Khuga. All these rivers originate from the surrounding hills. Almost all the rivers in the valley area in the mature stage and, therefore, deposit the load in the Loktak lake. The rivers draining the Manipur Hill Area are comparatively young due to the hilly terrain through which they flow. These rivers are corrosive in nature and assume turbulent form in rainy season. Important rivers draining the western area include Maku, Barak, Jiri, Irang and Leimatak. Rivers draining the eastern part of the State include Chamu, Khunou and other short streams. The total water discharge of the two river basins *viz.*, the Barak River basin draining the western part and the Manipur River Basin draining the eastern half of the state including the Manipur Valley has been estimated to be 1.8545 M hectare meters (15.04 M acre ft.). Manipur River Basin accounts for 0.5192-hectare metre of annual run off against a total catchment's area of 6332 sq.km. The Barak basin has a greater discharge capacity with 1.3295 M hectare metre against a catchments of 9042 sq. km. (Source : *I.F.C.D.*, 1984).

As per the available record of the Central Ground Water Board (CGWB), the valleys have superficial alluvium, which are underlined by tertiary rocks of Barail series in Imphal valley and the Tipam formations in Jiribam valley. Ground water in top sandy and clayey formations occurs under water table conditions with the depth of water varying from 3 to 4 metres bgl. Groundwater is mostly exploited through open wells. Ground water in the deeper aquifers occurs under sub-artesian and artesian conditions. Granular zones are encountered at a depth of about 150 m in Imphal valley and at about 220 m in Jiribam, valley. Tube wells have been installed at various places of the valley areas with the

yields ranging from 0.6 to 4 cu.m./hr. On the basis of the monitoring of water level in key/dug well network stations in the area, an annual recharge of 44 M.cu.m. has been estimated. Considering the clayey nature of formation in the top aquifer, development of this resource is not considered promising on a large scale in irrigation of water supply. However, it can be exploited for local water supplied through open wells, dug-cum-bore wells and tube wells. The partial chemical tests of these water samples have shown potability.

GEOLOGY

The rock formations occurring in the state of Manipur are the Cretaceous limestone, Eocene and Upper Cretaceous Disangs with serpentines, and Upper Eocene and Oligocene Barails and the Miocene Surmas and Tipams. The rock formation in the eastern part of the state consists of sandstone and shale siltstone, geosynclinal flysches with minor bands of greywacke (Bhattacharya and Bhattacharya, 1984).

Historically, the state of Manipur, was a part of Tethys sea in Archean period and continues to receive sediments of conglomerates and shales, sandstones and limestones of archaean rocks. Repeated organic movements accompanied by extensive igneous intrusions occurred in the successive periods that influenced the geologic and tectonic alignments of the region.

AGRICULTURE

This being the mainstay of the State's economy engages 76% of the workers. The size of the cultivated area is, however, only 9.41% of the total geographical area of the state. Of this total cultivated area, 52% is confined to the valley. Therefore, half of the total valley area, which accommodates 67% of the total population, is occupied for agriculture purposes. The pressure on land in the valley is thus quite conspicuous. Agriculture plays a vital role, as it is the main backbone of the state economy till today. The agriculture is mainly dependent on monsoon,

however, around 28.49% of area under cultivation is irrigated by canals. Moreover with a range of natural conditions and varied soil and topography, the state produces sizeable quantity of Paddy, Wheat, Maize, Pulses, Oilseeds (Mustard, groundnut, Soybeans, and Sunflower), Ginger, Turmeric and fruits like Pineapple, Lime/Lemon, Banana, Orange, Papaya, Plum and vegetables like Cauliflower, Cabbage, Tomato, Pea, Carrot, Pumpkin, etc. The existing area under fruits and vegetable crop is about 1.08% of the total geographical area and with such suitable agro-climatic conditions, the state still has lots of potential areas on the foot hills, mild hill slopes and along the river banks. The existing area under cultivation of different crops in Manipur is 2,85,000 hectares as against the available potential area of 3,25,500 hectares.

Rice, wheat, maize, oil seeds, potato and sugarcane etc. are the main crops in the state. Among these crops, cultivation of paddy is the largest both in the plains and hills, and covers 82% of the total cultivated area. Among the varieties of rice, there are two varieties, one locally named as "CHAK-HAO POIREITON" having its natural dark violet colour and a distinct flavour and the other "CHAK-HAO" having its natural white colour, scent and distinctive flavour. Next to paddy, maize is the second largest cultivated crop. It occupies about 40% of the gross cropped area and is grown mainly in the hills.

Manipur has vast potential for commercial plantation of citrus fruits like lemon, lime, orange, etc. and grapes, pineapple, banana, passion fruit, temperate fruits and other locally available fruits such as amla, olive, figs, mandarin and Heirukokthong etc. The quality of the pineapple (Q-variety) so available in Manipur has distinctive taste and flavour. So far, identified potential area is estimated at 2,77,000 hectares. Out of this about 24,000 hectares are covered under different crops. A new thrust area in the state is cultivation of mushrooms, as there is a vast scope for commercial cultivation of mushrooms in India and specially in the North-East which offers ideal weather conditions for mushroom cultivation.

Among commercial crops, Tea grows wild in this state since time immemorial. However, Manipur Plantation Crops Corporation Limited in Jiribam has started plantation of tea for commercial production from the year 1981-82. Considering the increasing trend of yield and productivity and also to arrest unremunerative income from sale of green tea leaf, a modern tea factory is being set up at Manipur Tea Estate, Jiribam.

Rubber Plantation under Forest Department, Manipur started in 1977-78 in Jiribam, a non-traditional, potential area covering about 938 Ha with an optimum climate, edaphic factors ideal for the successful growth of the rubber crop. Besides, there is a good transport facility to connect the area with good markets of rubber crop. So far, a total of 15,000 nos of rubber trees are put for tapping under half spiral alternate daily system (1/2 s d/2 system). Some mature areas are not put under tapping because of many factors such as non-availability of mature and tappable trees at regular spacing. The production of raw rubber is maximum during September to January, the dry season in Jiribam

Food Processing, yet another sector that plays a significant supportive role in diversification and commercialisation of agriculture. Horticulture, fisheries, poultry, animal husbandry and forest, improve value addition in the agricultural produce, employment generation thus providing income and production of agro-food products for export.

MINERAL RESOURCES

Report from the Findings of the Geological Survey of India revealed the presence of a substantial deposit of good quality limestone suitable for use in the manufacture of cement near Ukhrul, Hundung, Mova, Khonggoi, Lambui and Paoyi. In the Ukhrul area, limestone occurs in two bands. A reserve of 579 M tonnes has been proved by drilling to a depth of 105 meters. Other deposits are 0.26 M tonnes at Khonggoi and 1.88 M tonnes at Hundung. Similarly, Evaporities have been located which are the

mineralised salt sediments from the evaporation of saline waters specially the sea waters and minor occurrences of magnesium and other salts in Kongai area of Chingai sub-division of Ukhrul District.

Chromite containing partly metallurgical grade ore, located at Kwatha and Khudengthabi in Chandel District and near Sirohi Peak in Ukhrul District at an altitude of 1120 m. Production of Chromite in 1993-94, 1994-95, 1995-96, 1996-97 are 643 MT, 784, 470 MT and 62 MT respectively. Nickeliferous magnetites, copper and cobalt have been located at Kwatha, Khudengthabi and Nampshesha along the ultramaphic expositions near Moreh. Minor occurrences of Asbestos have been reported from the ultramaphic suites of rocks particularly in the Ukhrul and Moreh areas and Jadeite, a semi-precious mineral occurs in the Indo-Burma borders. The high chromic oxide content and hard lumpy character reveal that it is of metallurgical grade, which is in short supply in the country. Other compact coloured minerals include the serpentinites found in the same belt.

Lignites, a fossil fuel, have been located at Kangvai (Churachandpur District) and some other places but they have been found to be uneconomical as the study of borehole data revealed that in general the thickness of lenses down to a depth of 25 m ranged from 0.1 to 5 m. The Central Ground Water Board encountered gas emanations during exploratory drillings. Samples of oil and gas emanated at Lamphelpat indicated resemblances of crude oil. Coal is reported from the Jiribum subdivision of Manipur. The coal was friable in nature and dull in luster, giving a sulphurous smell on burning.

Nickel associated with serpentine body, was reported from Nampesh and Kwatha areas lying in the eastern fringes of the state. Geological findings of nickel revealed the presence of metallic nickel dispersed in the soil as high concentrations mostly in the order of 4,000 ppm. Besides nickel, Nickeliferous copper sulphides, chalcopyrite and chalcocite with cuprite and malachite were found at Nungan and Konal thana as small lenses and

viens in basic and ultrabasic rocks. Maximum values in a batch of eight grab samples collected from pits are 10.56 percent copper and 0.33 percent nickel.

FOREST RESOURCES

As per the records of the Forest Survey of India (2001), Manipur has 78.00 percent of its total geographical area covered by forests. This accounts for an area of 17,418 sq km under forest

cover, the reserve forest occupying 1,467 km², protected forest occupying 4,171 km², and unclassified forests-11,780 km². The forest classification according to vegetation types goes well along vertical attitudinal stratification's, as can be seen below. A broad classification of forests according to the status of forest cover interpreted from the Landsat imagery is being produced (Types of forest). The district wise forest cover is given below :

District	Area	FOREST COVER				
		Dense forest	Open forest	Total	Percent	Scrub
Bishnupur	496	4	8	12	2.42	3
Chandel	3,313	812	1,906	2,718	82.04	49
Churachundpur	4,570	1,240	2,933	4,173	91.31	47
Imphal East	669	38	125	163	24.36	17
Imphal west	559	14	25	39	6.98	3
Senapati	3,271	788	1,554	2,342	71.60	40
Thamenglong	4,391	1,700	2,229	3,929	89.48	0
Thpubal	514	3	21	24	4.67	7
Ukhrul	4,544	1,111	2,415	3,526	77.60	24
TOTAL	22,327	5,710	11,216	16,926	75.81	190

Minor Products : Various forms of animal produce, bamboo and cane, fodder and fuel wood, grass and reeds, incense and perfume and medicinal plants form the minor forest produce, agarwood, dalchini and smilax form significant groups among these.

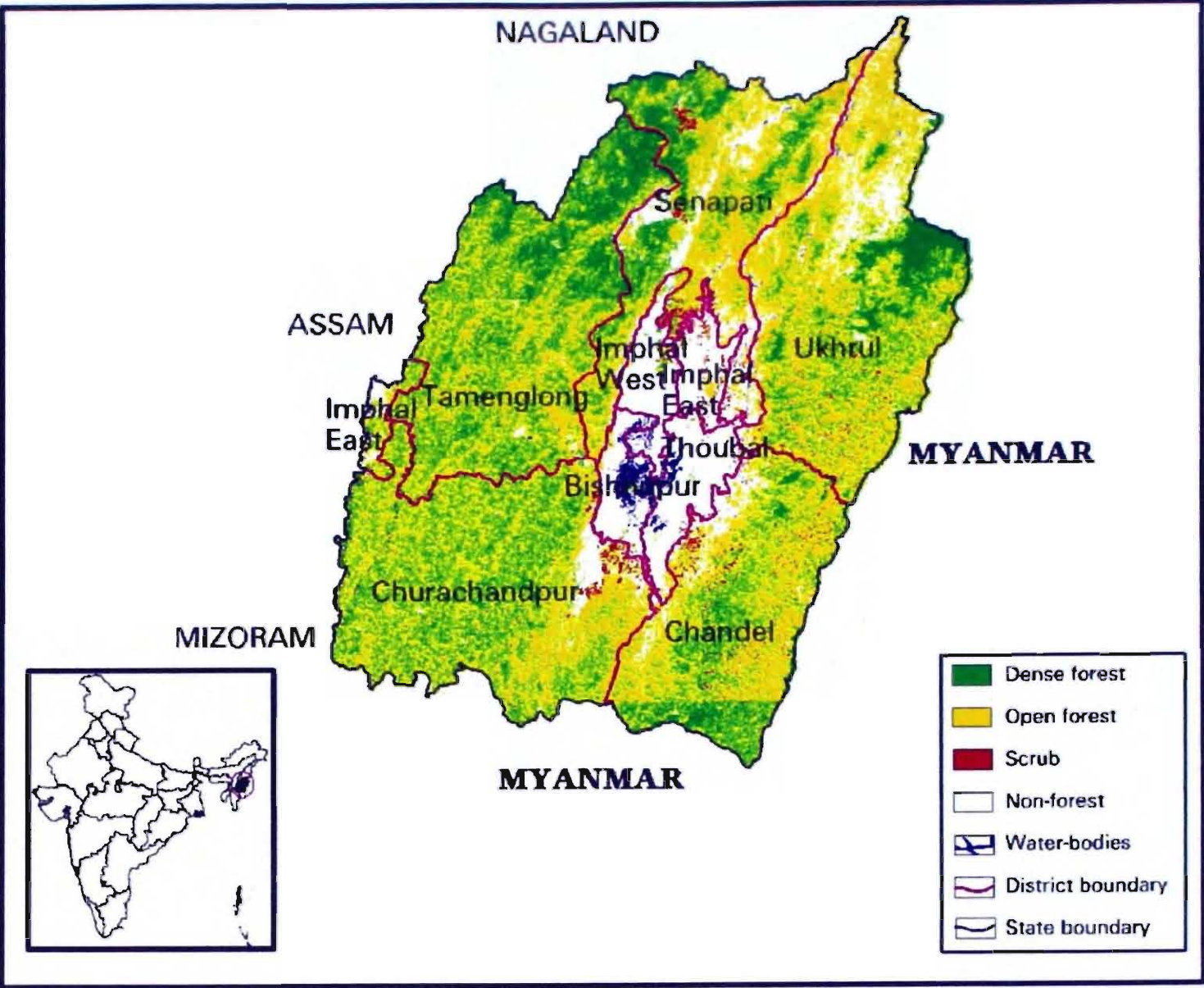
LEGAL CLASSIFICATION

The legal position of forest administration in the state is fluid. The government has extended its

control to a small portion of the forest comprising 1,467 sq km of Reserved Forest and 4,171 sq km of Protected Forest which together constitute only 25.25% of the total area or 31.99% of the total forest area. The remaining 68.01% of forests are unclosed forests under the control of the tribal populations. These unclosed forests are subject to widespread exploitation by the hill people, who at some areas meticulously guard patches of tree growth.

Table 1. Forest types and composition

Semi Evergreen Forests	Teak Gurjan Forests	Wet hill Forests	Pinus Casia Forests	Wet Temperate Forests	Sub-Alpine Forests
Location : Western part of Manipur adjoining Cachar district of Assam. Composition : <i>Phoebe lanceolata</i>, <i>Cinnamom cecidodaphne</i>, <i>C. abtusifolium</i>, <i>Actinodaphne sikkimensis</i>, <i>A. aboyata</i>, <i>Machilus macrantha</i>, <i>M. parviflora</i>, <i>Litsaea salicifolia</i>, <i>Lindera merlastomaea</i> (Family Lauraceae); <i>Amoora rohituka</i>, <i>A. wallichii</i>, <i>Toona ciliata</i>, <i>Cedrela febrifusa</i>, <i>Dysoxylum binectariferum</i> and <i>D. hamiltoni</i> (Meliceae). <i>Bauhinia</i> as a codominant is represented by <i>B. purpurea</i> and <i>B. Variegata</i>. Other species like, <i>Artocarpus chaplasha</i>, <i>Palagim polyanthum</i>, <i>Cynometra polyandra</i>, <i>Tetrameles nudiflora</i>, <i>Eugenia</i> sp., <i>Vitex</i> sp., <i>Gmelina</i> sp., <i>Pasania</i> sp., <i>Allanthus grandis</i>, <i>Schima wallichii</i>, <i>Ilex khasia</i>, <i>Sapium baccatu</i>, <i>Evodia meliaefolia</i>, <i>Eleocarpus lancifolia</i>, <i>E. aristara</i>, <i>Morus laevigata</i> Climax forest : <i>Laurus-Melia Bauhinia</i> association Extent : 439.70 sq.km of Tree forest and 205.19 sq.km. of the open forest (constitute 5.5 of totals forest area in the state). Extensive lush growth of Muli bamboo (<i>Melocanna basifera</i>) can also be seen on the abandoned jhum fields.	Location : Eastern longitudinal strip of Indo-Burma border at low altitude under a tropical climate Compoaition : The dominant species of this belt are <i>Tectona grandis</i>, <i>Dipterocarpus tuberculatus</i>, <i>D. tearbinatus</i>, <i>Melanorrhoea usitata</i>, <i>Dillenia</i> sp., <i>Xylia</i> sp., <i>Langstroemia</i> sp., <i>Terminalia</i> sp., <i>Gmelina</i> sp. and <i>Bombax</i> sp., etc Extent : 3.48 p.c. of total forest area.	Location : upper slopes upto the top of the medium elevations (<i>Saurauja-Belischmiedia-Phoebe</i> association) Composition: The dominant species are, <i>Saouraja nepalensis</i>, <i>S. panduana</i>, <i>S. roxburghiana</i>, <i>Phoebe lanceolata</i>, <i>P. paniculata</i>, <i>Beilschmiedia assamica</i>, <i>B. roxburghiana</i>, <i>Schima wallichii</i>, <i>Quercus</i> sp., <i>Nyssa sessiliflora</i>, <i>Cinnamom cecidodaphne</i>, <i>C. pauciflora</i>, <i>Eriobotrya bengalensis</i>, <i>Echinocarpus dasycarpus</i>, <i>Morus laevigata</i>, <i>Litsea panamonja</i>, <i>L. sebifera</i>, <i>Cryptocarea andersoni</i>, <i>Machilus odoratissima</i>, <i>M. parviflora</i>, <i>M. bombycina</i>, <i>Ostodes paniculata</i>, <i>Lithocarpus spicatus</i>, <i>Engelhardtia</i> sp., <i>Vaecinium dominianum</i>, <i>Castanopsis</i> sp. Extent : 391.20 sq.km. of Tree forests and 2,672.00 sq.km. of open forest that may account for 56.13 p.c. of the total forest area of the state.	Location : Sub-montane zones of the north-eastern and southern hills of Manipur. Composition : The dominant species are, <i>Quercus</i> sp., <i>Pasania</i> sp., <i>Castanopsis</i> sp. etc. Extent : These form 12.94 p.c. of the tree forests and 7.87 p.c. of the open forests	Composition : <i>Quercus lamellosa</i>, <i>Q. lineata</i>, <i>Q. glauca</i>, <i>Pasania xylocarpa</i>, <i>P. pachyphylla</i>, <i>P. truncata</i>, <i>Michelia lanugiosa</i>, <i>M. Campbell</i>, <i>Phoebe paniculata</i>, <i>Schima khasiana</i>, <i>Alseodaphane dumicola</i>, <i>Castanopsis tribuloides</i>, <i>Evodia fraxinifolia</i>, <i>Acer campbelli</i>, <i>Betula alnodes</i>, <i>Prunus cerasoides</i>, <i>Pyrus pashia</i>, <i>Osa gigantia</i>, <i>Mohima manipurensis</i>, <i>Manglietia insignis</i>, <i>Illicium griffithii</i>, <i>Bucklandia pupulanea</i>, <i>Michlia manipurensis</i> etc. Dominant species : The high altitude dwarf bamboo, <i>Arundinaria malines</i> Extent: 10.94 % while disturbed open forests account for only 1.41 p.c. of total forest area	Location : Not many ranges reach a height beyond 2700M in Manipur. Composition : <i>Prunus</i> sp., <i>Pyrus</i> sp., <i>Taxus</i> sp., <i>Ilex</i> sp., <i>Ternstroemia</i> sp., <i>Bucklandia populanea</i>, <i>Acer campbelli</i>, <i>Magnolia campbelli</i>, <i>Castanopsis aribuloides</i>, <i>Rhododendron madinii</i>, <i>R. johnstoneaum</i>, <i>R. manipurensis</i>, <i>R. Wattii</i>, <i>R. elliottii</i>, and <i>Primula</i> sp. etc.



Forest Cover Map of Manipur

Source : Forest Survey of India, Dehra Dun

Sl. No	Name of Block	Geographical area (sq. kms.)	Total Bamboo area (sq. kms.)	Qty. Of bamboo in lakh tonnes	Annual yield calculated on growing stick (in lakh tonnes)
1.	Thanlon	1238.40	387.00	10.14	1.69
2.	Henglep	637.26	206.08	4.63	0.77
3.	Nungba	1465.44	278.14	13.89	2.28
4.	Tipaimukh	789.48	278.64	7.92	1.32
5.	Jiribam	309.60	36.12	0.70	0.12
6.	Tamenglong	1083.60	283.80	5.09	0.85
Total :		5523.78	1470.28	42.37	7.03

Source : Forest Department, Manipur

FAUNAL EXPLORATIONS

Knowledge of the faunal resources of the state is well documented by the explorations conducted by various teams of scientists and naturalists. Blyth (1863), Jerdon (1867) were first to give the list of mammals present in the Asiatic Society. Mention may be made on the faunal exploration by Godwin-Austen, (1868) who first procured mammal specimen for the taxonomic study. Later during, 1874-82, gave the systematic account of birds and equally worked on the Molluscan fauna of Manipur during (1875, 1882-88, 1889, 1920). Dobson (1876) first published the description and distribution of Chiroptera. Anderson (1881) and Sclater (1891) published the catalogue of mammalian species present in the Indian Museum. Works on the molluscs of Manipur by Annandale, Prashad and Amin-ud-Din (1921), Gude (1914) and Preston (1915) are worth mentioning.

The first record of moths and butterflies is from the work of Buttler (1885), Cotes & Swinhoe (1887-89), Elwes (1891-92); Hampson (1892) in Fauna of British India, Fruhstorfer (1913), Tytler (1914-15) in the Butterfly fauna of Manipur and Nagaland. Roepke (1944), Wynter-Blyth's (1957) work on the moths and butterflies of the state are of importance. The work of A.O. Hume (1888), Oates (1883-90) on birds; Allen (1905) on game birds, Higgins (1913, 33-34) on birds are worth

mentioning. The exploration of Burmese fauna by Lewis (1888-1894) on Coleoptera, Erichson's (1834) first description on *Cybister (Melanonectes) sugillatus* from Manipur, Cameron (1930-39) on fauna of British India, Kapur (1952) on the description of a new coccinellid can also be noted. The first record of two species of Hemiptera from the state comes from the work of Distant (1908), similarly, the first record of Diptera from Manipur comes from the work of Rev. W. Pettigrew from Ukhrul during 1908, followed by the work of C.S. Guthrie (1842), McClelland (1844), Barraud (1922), Brunetti (1923), I. M. Puri (1932) and F. Schmid (1960) on insects. The first record of Ticks comes from the work of Kohls (1948), who described a new species from Manipur.

Among Vertebrates, the first record of a new species of fish *Noemacheilus manipurensis* by Chaudhury (1912) and the description of Fishes of Loktak from the work of Hora (1921) is of significance. Reports of staggering number of game birds shot by the British personnel during 1910-32 from Manipur (Higgins, 1933-34) and the wanton destruction of the species from the state, and its impact on the present day diversity and distribution is very significant in the faunal resources of the state.

Since there is no precise scientific inventory

of the various faunal groups of the state, the present publication is an attempt by the scientists of the Zoological Survey of India to explore and to document the fauna of the state under the Action Plan of the Ministry of Environment & Forests.

FAUNAL DIVERSITY

The analysis of the faunal exploration and documentation brought out in two volumes reveal nearly 2601 species belonging to various categories in 1261 genera, 368 families, of which 5 are new to science, 509 species are new records to the state and 28 are new records to the country. Among these faunal groups insects dominate the number with 1220 species followed by birds with 586 species, fishes 141 species and molluscs 127 species. A brief description of the summary of inventorisation is given in table 2.

78 species of free living and 8 species of parasitic protozoa are recorded for the first time from the state, among them, the Imphal district represents maximum number of species followed by Jiribum and Bishenpur. It is interesting to note that flagellates, rhizopods and ciliates of Lake Kangla, Imphal (10, 17, 20 species respectively) has more or less the same number of species as that of the Loktak lake, Bishenpur (9, 18, 18). Of the 34 species of parasitic nematodes described from the state, the following three species are new to science and the genera, *Soboliphyme* is entirely new to the country :

Pseudaprocta manipurensis

Soboliphyme manipurensis

Spirura manipuri

Records of 52 species of freshwater molluscs and 75 species of land molluscs are available from the state, of which 9 freshwater species and 17 species of land molluscs are recorded for first time from the state. A large number of molluscs are of consumptive value, which is not taken to the National exchequer viz., *Bellamyia bengalensis*, *Cipangopaludina lecythis*, *Angulygra oxytropis*, *Brotia costula*, *Paludomus blanfordiana* and *Paludomus conica* among gastropods and

Lamelliedens marginalis, *L. corrianus*, *L. generosus*, *Paresysa burmanus*, *P. occata* and *Trapezoideus exolens* among bivalves are available, and are sold in the local markets.

The phylum Arthropoda is remarkable in having the largest number of classes, orders, families, genera and species in India. Crustacea though a major class of the phylum is represented by only 9 species in the state. The Arachnida, another major class is known by 17 families under Acari and 11 families under Araneae represented by 27 and 30 genera and 41 and 52 species respectively. The other groups under the Arthropod except the Insecta are poorly known in the state. There is high degree of endemism among them but our knowledge is limited in the groups Crustacea, Insecta and as well as Arachnida.

India by virtue of her very rich evergreen and subtropical vegetation in the Eastern Himalayas and the adjoining areas in the state, has a highly rich fauna of coleoptera with 42 families, 188 genera, 335 species. However, in comparison to the other Northeastern states, the faunal composition of this group needs to be adequately explored. Perhaps the number of species known at present would be more than double in the long run. It is evident that the lepidopterous fauna is much more concentrated in the eastern Himalayas as far as the Myanmar border than in the other parts of the country. But the microlepidopterous fauna as well as several families of moths like Casteniidae, Neopseustidae, etc. are poorly known. On the basis of available information, it may be presumed that about 10-15% lepidopterans still await discovery. The present investigation reveals 61 families, 112 genera and 183 species, of which 26 are threatened (Schedule-I = 10 spp., Schedule-II = 16 spp.). Major concentration of hymenopterous species is in the hilly and densely forested areas with 19 genera and 35 species in the state. A great diversity of hemipterous insects is found in the state, with 31 families, 174 genera and 290 species. In fact, aphids attracted much more attention than several other groups. Likewise the other Himalayan belt and the Manipur hills

Table 2. Details of present Faunal Inventorisation by Zoological Survey of India

No.	Group	Family	Genera	Species	New to Science	New record to the State	New to India	Remarks
1	PROTOZOA	37	54	86				
2	NEMATODE(PARASITIC)			34	3	34		
3	MOLLUSCA		45	127				
4	CRUSTACEA : DECAPODA		3	9				
5	INSECTA							
	Thysanura	1	1	2		1		
	Collembola	3	14	27		27		
	Ephemeroptea	4	5	6				
	Odonata	8	41	68				
	Orthoptera	2??	56	71		52	4	
	Blattaria	5	6	8		8		
	Isoptera			22				
	Psocoptera	5	7	7		6		
	Hemiptera	31	174	290		10		
	Coleoptera	42	188	335		159	15	
	Diptera :	12	56	91	1 ssp	39		
	Lepidoptera : (Butterflies)	61	117	188		42		26 threatened (Shedule _ I = 10spp., Schedule- II = 16 spp.)
	Hymenoptera : Formicidae	1	19	35		35	4	
	Trichoptera	13	25	114				
	ACARI : ORIBATID MITES	17	27	41		34		
	ARANEAE : SPIDERS	11	30	52	1	52	1	
6	PISCES	24	64	141		10	4	
7	AMPHIBIA	5	7	14				Very common – 3, Common – 3, Rare- 8,
8	REPTILIA : SQUAMATA	5	6	9				
9	AVES	59	261	586				
10	MAMAMLIA	22	55	69				75 Species & Suspecies
11	FOSSIL ANIMALS	82	134	167				102 spp Protozoa, 4 species of coelenterata, 3 species of bryozoa, 5 species of crustacea, & 37 species of mollusca.
	Total	450	1395	2601	5	509	28	

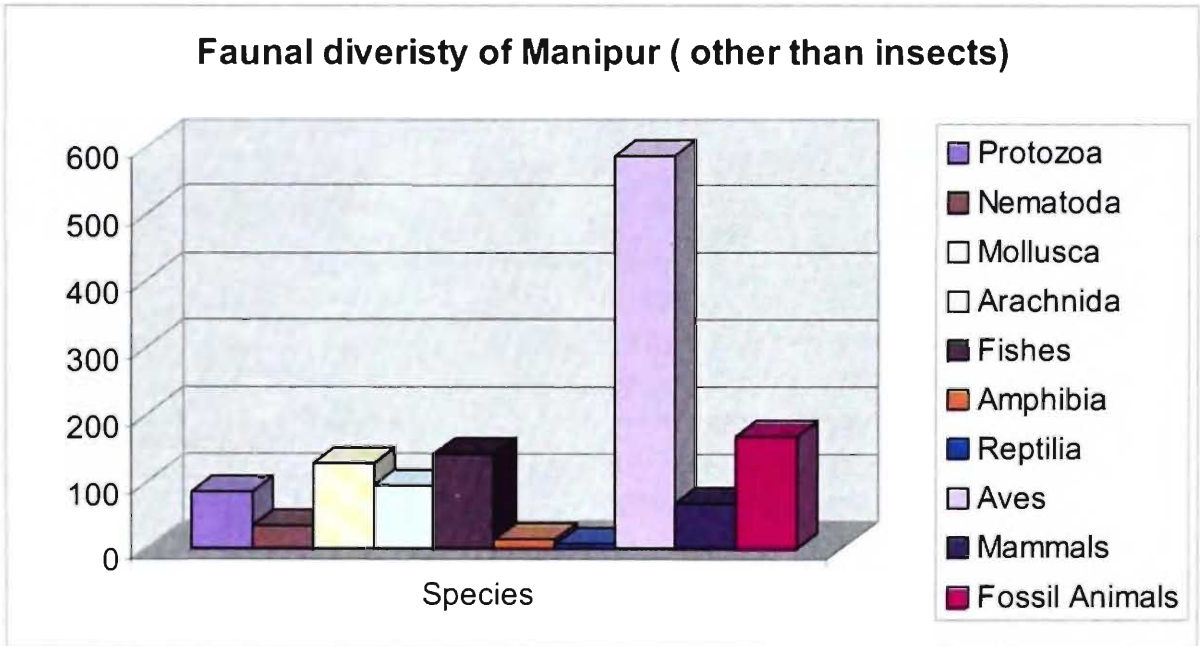
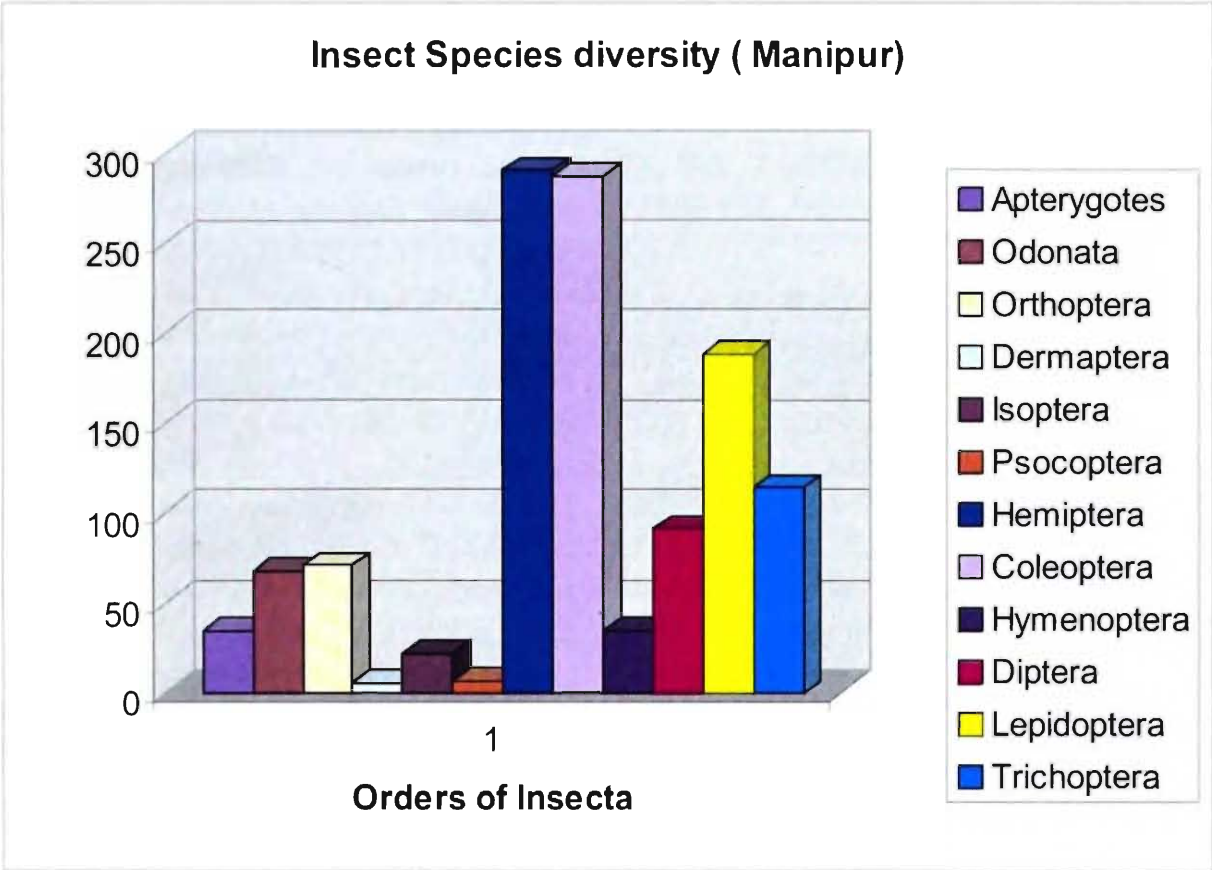


exhibit maximum concentration of the dipterous insects both qualitatively and quantitatively with 12 families, 56 genera and 91 species recorded in the state. It is true that the known fauna is far from satisfactory and it is estimated that the number of species still undiscovered, may exceed known ones from the state.

Besides the above major groups, the Orthoptera is ranked below with over 71 species. There are other orders, viz., the Trichoptera with 25 genera and 114 species, Thysanura with single genera and two species, Ephemeroptera with 5 genera and 6 species and Odonata with 41 genera and 68 species. It is extremely difficult at this stage to estimate the actual diversity unless systematic exploration is undertaken all over the state. Several insect orders such as Neuroptera, Phthiraptera, Dermaptera, Siphonaptera, Embioptera, Mecoptera and the Strepsiptera are insignificantly known. The Blattaria are represented by 6 genera and 8 species. It is mentionable that maximum diversity of these insects is encountered in the tropical rain forest areas of the state.

The Indian fish diversity represents 11.72% of the world, comprising of 2546 species under 969 genera, 254 families and 40 orders. 1570 are marine and 930 are freshwater inhabitants (Jayaram, 1999). The state of Manipur is now represented by 64 genera and 141 species of freshwater fishes, representing 15.16 of the total Indian freshwater fishes of the country.

The Indian amphibia comprises of 229 species under 40 genera, 9 families and 3 orders, and the species are not evenly distributed throughout India; the highest concentration is found in Western Peninsula followed by North-east. Interestingly all the three living orders of Amphibia viz. Gymnophiona, Caudata and Anura are distributed in North-east India, but the state of Manipur is represented by a limited number, 14 species, which is an underestimate to the state. The reptile fauna is equally under represented by 6 genera and 9 species in the state.

The state of Manipur is well represented as far as the aves are concerned, out of total 1232

species and subspecies of birds known from the subcontinent (Alfred *et.al.* 2001), as many as 586 are represented in the state, which accounts nearly 48 percent of the total record. Among them 32 of 138 species are under threat as per IUCN guidelines. One out of nine listed is Critically Endangered (*Gyps bengalensis*), two out of ten species are Endangered (*Cairina scutellata* and *Buceros bicornis*); 17 out of 57 are classified as Vulnerable (*Anas formosa*, *Aythya baeri*, *Aquila clanga*, *Falco naumanni*, *Perdicula manipurensis*, *Tragopan blythii*, *Syrnaticus humiae*, *Grus monacha*, *Grus antigone*, *Heliopais personata*, *Gallinago nemoricola*, *Columba punicea*, *Aceros nipalensis*, *Spelaornis longicaudatus*, *Turdoides longirostris*, *Turdus obscurus* and *Sitta Formosa*) and 12 species out of 52 are classified as Near Threatened (Birdlife International, 2001). Important Bird Areas Programme of Bird Life International has also identified, Ango Hills, Dzuko, Kailam, Siroi, Yangoupokpi, Bunning Wildlife Sanctuaries, the Loktak and Keibul Lamjo National Park, as conservation sites for birds in the state.

75 species and subspecies under 55 genera and 22 families of mammals are recorded from the state out of 397 species in the country. District wise distribution indicates the mammalian distribution is more concentrated in Imphal district with 36 species, followed by Senapati 28 species and Chandel 24 species. Among primates, two species *Nyctcebus coucang* (Slender Loris) and *Macaca arctoides* (Stump tailed Macaque) are restricted to Chandel district, *Macaca mulatta* and *M. assamensis* in Imphal while the *Bunopithecus hoolock* and *Presbytes pileatus* is restricted to the Senapati district. Of the 75 recorded species from the state, nearly 22 species are conserved under Wildlife Protection Act, 1972, besides including 5 species under Vulnerable, 4 species under Near Threatened (Lower Risk) and 2 with Data Deficient as per the IUCN guidelines. Mention may be made of a lone species of *Cervus eldi eldi* restricted to the state of Manipur and now under protection at Keibul Lamjao National Park, (declared on 28th March, 1977),

with an area of 40 km² located at an altitude of 767-788 m and at Latitude 24°27'-24°31' N, Longitude 93°53' E-93°55' E. This has an ideal condition for the Manipur Brow Antlered Deer to

be conserved, as the area has a combination of aquatic wetland and terrestrial ecosystem. The Sangai, (as they are popularly called) population, in the National Park is as given below :

Year	Type of Survey	Stag	Hind	Fawn	Total
1990	Aerial census				76
1991	Ground census				104
1992	Aerial census				62
1993	Ground census				98
1994	Ground census				137
1995	Ground census	58	69	25	152
1998	Ground census	56	62	28	156
1999	Ground census	63	61	25	149
2000	Ground census	54	76	32	162

(Source : Forest Department, Manipur)

The first survey by a team from Zoological Survey of India, during 1972-75 yielded substantial result in the conservation of the species, as this formed the baseline for future bioecological as well as conservation measures to be adopted to save this animal from extinction.

The present book also deals with 167 species of fossilised animals, 2 trace fossils and 23 species of calcareous nannofossils. The major composition of fossils consists of 68 species of foraminifera, 34 species of radiolaria, 4 species of coelenterata, 3 species of bryozoa, 5 species of crustacea, and 37 species of mollusca. The assemblage of microfauna of Ophiolite belt of Ukhrul area was referred to late cretaceous age, while the fauna associated with the exotic blocks were of varying age from Paleocene to Upper Eocene.

Loktak Lake : Largest freshwater of Northeast India, designated as the Wetland of International Importance during 1990. Loktak have considerable economic, ecological as well as cultural value to the state of Manipur. The important character feature of the lake is the presence of floating islands covered with vegetation, often called as

the “Phumdis” of varying thickness. The largest and the continuous mat of Phumdis are located on the southern part near the Keibul Lamjao National Park, which is the home for the Sangai. Phumdis are locally used by the fishermen community for fishing in the lake, more than 2000 people live on Phumdis. Besides fishing, plant communities present on Phumdis are locally used for medicine, food, fodder as well as fuel. It is also believed that the phumdis play an important role in the ecological processes and functions of the lake, as they provide key nutrient and acts as biological sink to the key nutrients. The lake ecology has been altered by the construction of Ithai barrage across the Manipur River for the storage of water to generate electricity. This has also resulted in rapidly eroding the rich biodiversity of the lake.

PROTECTED AREA NETWORK

Environmental awareness, education and dwindling faunal resources in the state of Manipur due to demographic pressure has necessitated the state authorities to increase the area under

Protected Area Network and its management, for the conservation of Wildlife species in the state. As a result, the following action has been initiated

for conservation and management of wildlife besides enforcement of Wildlife (Protection) Act, 1972 and the Biodiversity Act.

<i>In-situ</i> Conservation site	Location (District)	Area in sq km
Keibul Lamjao National Park	Bishenpur	40.00
Yangoupokpi Lokchao Wildlife Sanctuary	Chandel	184.80
Bunning Wildlife Sanctuary	Tamenglong	115.80
Zeliad Wildlife Sanctuary	Tamenglong	21.00
Keilam Wildlife Sanctuary	Churachandpur	187.50
Jiri-Makru Wildlife Sanctuary	Tamenglong	198.00
Shiroi Hill National Park	Ukhrul	41.00
<i>Ex-situ</i> Conservation sites	Location (District)	Area in sq km
Manipur Zoological Garden	Imphal (Iroishemba)	0.08
2nd Home of SANGAI	Imphal (Iroishemba)	0.60
Orchid Preservation Centre	Imphal (Khonghampat)	0.50

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MAMMALIA

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INTRODUCTION

Out of a total of 4,629 species of mammal known from the world, 372 species occur in the Indian union (Corbet & Hill 1986), 397 Alfred *et al.* 2001. Of these, 69 Species (75 species and subspecies) are being reported from Manipur.

Our knowledge about the mammalian fauna of Manipur is rather patchy. Lt. Col. H. H. Godwin-Austen (1868) appears to be the first who procured specimens of mammals from Manipur, for taxonomic study. A few examples of mammals were collected by a party of the Zoological Survey of India from the Naga Hills and Manipur during February-March 1936. After the II world war, Dr. M. L. Roonwal of the Zoological Survey of India, as leader of the Field Typhus Research Team to investigate Tsutsugamushi disease, collected mammalian specimens during the period June-December 1945, mostly from central Manipur. After the Eastern Regional Station of the Zoological Survey of India was established at Shillong in 1959, various workers of that Regional Station surveyed different parts of Manipur and obtained mammalian specimens.

After the initiation of the project on the fauna of Manipur, scientists from ZSI surveyed different parts of Manipur in March 1992 and November-December 1992 for the study of mammals.

The larger mammals, especially the game animals, of Manipur are more or less well known, and accounts are available in Allen (1905) and Higgins (1934). A. O. Hume made collections in Manipur in the last quarter of the 19th century,

which was reported upon by Thomas (1886). Annandale (1921) casually mentioned that otters are plentiful in Manipur but did not name the species. Blyth (1863) listed all specimens of mammals present in the museum of the Asiatic Society, including that State. Jerdon (1867) provided a preliminary descriptive account of mammals of India, which also included those from Manipur. Dobson (1876) published his monumental work on the Asiatic Chiroptera in which description, distribution, etc., of all the bats known from Manipur up to that time were provided. The first complete faunal account on Indian mammals was authored by Blanford (1888, 1891). During this period, Anderson (1881) and Sclater (1891) published catalogues of mammalian specimens present in the Indian Museum, which naturally included those from the present state of Manipur. Later, Pocock's fauna of British India on Primates and Carnivora (1939, 1941), Ellerman's Fauna of India on Rodentia (1961) and Ellerman & Morrison-Scott's checklist (1951, 1966), all included faunal accounts of mammals from Manipur.

While the surrounding districts of Assam and Myanmar were fairly surveyed for mammals by the Mammal Survey of India conducted by the Bombay Natural History Society in the early part of twentieth century, and later reported by various workers (Wroughton 1918, 1919), Manipur remained more or less unsurveyed. A detailed account of the ecology, bionomics and systematic aspect of mammals of Manipur are available in Roonwal (1949, 1950). His study included 35

species and subspecies of mammals belonging to six orders. Of these 3 were new subspecies of rats and mice. Very recently Mandal *et al.* (1993, 1994) recorded three bats and one shrew and Sinha (1994) also reported some bats from Manipur.

The Present paper is based on the specimens of mammals, from Manipur present in the Zoological Survey of India, Kolkata and its Eastern Regional Station, Shillong, as also on published literature.

Complete synonyms have not been given, as these are available in Blyth (1863), Jerdon (1867), Dobson (1876), Anderson (1881), Blanford (1888, 1891), Sclater (1891), Pocock (1939, 1941), Ellerman & Morrison-Scott (1951) and Ellerman (1961). Current Synonymies have, however, been discussed under 'Remarks'

Measurements have been expressed in millimetre (except where stated otherwise) and have been taken after Pocock (1939, 1941) for Primates and Carnivora, Khajuria (1953) for Chiroptera, and Ellerman (1961) for Rodentia.

Following is a list of abbreviations used for various measurements : *apf* = length of anterior palatal foramina; *b* = length of bulla; *c* – *c*' = distance between cingula of upper canines; *cb* = condylobasal length; *ccl* = condylocanine length; *cr* = cranial rostrum; *cw* = cranial width; *d* = length of diastema; *E* = length of ear; *Fa* = length of forearm; *F* & *Cl* = length of foot and claw; *H* & *B* = length of head and body; *Hf* = length of hindfoot; *iw* = least interorbital width; *l* = greatest length of skull; *m*' – *m*' = distance between outer surfaces of first upper molars; *m*³ – *m*³ = distance between outer surfaces of third upper molars; *ml* = mandibular length; *mtr* = length of maxillary tooth-row; *mw* = maxillary width; *n* = nasal length; *on* = occipitonasal length; *orb* = length of orbit; *pl* = palatal length; *pow* = postorbital width; *Tb* = length of tibia; *Tl* = length of tail; *Tr* = length of tragus; *ZSI* = Zoological Survey of India; *zw* = zygomatic width.

SYSTEMATIC ACCOUNT

Order SCANDENTIA

Squirrel-like in appearance with long snout; whiskers absent.

The Order Scandentia comprises of a single family Tupaiidae.

Family TUPAIIDAE

Only one genus *Tupaia* of the family Tupaiidae occurs in Manipur.

Genus *Tupaia* Raffles, 1821

The genus *Tupaia* is represented in Manipur by a single species and subspecies.

1. *Tupaia belangeri assamensis* Wroughton

1921. *Tupaia belangeri assamensis* Wroughton, *J. Bombay nat. Hist. Soc.*, **27** : 599 (Mokokchung, c 1524 m, Nagaland, India).

Common name : Northern Tree Shrew (Eng.).

Material examined : Senapati district : 1♂, 26 km N of Imphal on Dimapur Road (c 1067 m), coll. M. L. Roonwal, 27.xi.1945; Chandel district : 1 unsexed, Moreh (c 177 m), coll. M. L. Roonwal, 10.viii.1945.

Measurements : None.

Diagnosis : Tail shorter than head and body; colour grizzled yellowish-brown on the back, ventral colour yellowish buff or orange buff; fur long, soft and thick, with long dark brown hairs.

Distribution : India : Manipur : Chandel district, Senapati district (Roonwal 1950); Arunachal Pradesh; Assam; Nagaland; Tripura.

Order INSECTIVORA

Animals usually small in size. Snout pointed and projecting far beyond the lower jaw. Body covered with short closely-set fur. Eyes and ears small. Orbits open posteriorly. Limbs short and five-toed. Zygomatic arch may be present or absent.

The order is represented in Manipur by two families, namely, Talpidae and Soricidae.

Key to the families of the order INSECTIVORA

- Zygomatic arches present, bulla ossified
..... TALPIDAE
- Zygomatic arches absent, bulla imperfect
..... SORICIDAE

Family TALPIDAE

One genus of the family Talpidae occurs in Manipur.

Genus *Talpa* Linnaeus, 1758

Body covered with very short velvety fur; eyes minute; pinna absent; forepaws broad, with outwardly directed heavy claws; small tail, scantily haired.

One species of the genus *Talpa* occurs in Manipur.

2. *Talpa micrura* Hodgson

1841. *Talpa micrurus* Hodgson, *Calcutta J. nat. Hist.*, 2 : 221 (Nepal).

Common name : Eastern Mole, Short-tailed Mole (Eng.).

Material examined : None.

Measurements : Nil.

Diagnosis : Animal with a very small tail, almost concealed by fur; colour steely black or brown; snout and feet flesh-coloured; premolars 4/4 in number.

Distribution : India : Manipur : Imphal district (Roonwal 1950); Arunachal Pradesh; Assam; Meghalaya; Nagaland; Sikkim; West Bengal.

Elsewhere : Nepal and Bangladesh.

Remarks : Commonly found between 1000 m and 1500 m altitudes where it lives in deep beds of vegetable moulds.

Family SORICIDAE

Mouse-like small animals with velvety fur;

muzzle elongated and narrow; eyes very small; ear-conch small; limbs short; zygomatic arches absent; auditory bones of annular shape.

Four genera of the family Soricidae occur in Manipur.

Key to the genera of the family SORICIDAE

- 1. Ear-conch small; tail very short
..... *Anourosorex*
- Ear-conch and tail well developed 2
- 2. Teeth tipped brown *Soriculus*
- Teeth entirely white 3
- 3. 18 teeth in upper jaw *Suncus*
- 16 teeth in upper jaw *Crocidura*

Genus *Soriculus* Blyth, 1854

Fur soft and velvety. Tail, slender, tapering gradually like that of mouse, with no scattered hairs on it; ears concealed within the fur. Teeth white, tipped with ferruginous or pitch colour.

One species of the genus *Soriculus* is found in Manipur.

3. *Soriculus caudatus caudatus* (Horsfield)

1851. *Sorex caudatus* Horsfield, *Cat. Mammal. Mus. E. India Co.*, : 136 (Darjiling, Darjiling district, West Bengal, India).

Common name : Hodgson's Brown-toothed Shrew (Eng.).

Material examined : None.

Measurements : Nil.

Diagnosis : Tail slender and of the same length as head and body. Hind feet slender, with short claws. Ears hairy and partially hidden in the fur. The second upper incisor larger than the third and exceeds the canine in length.

Distribution : India : Manipur (Ellerman and Morrison-Scott 1966); Sikkim; Uttar Pradesh; West Bengal.

Elsewhere : Nepal and Myanmar.

Genus *Suncus* Ehrenberg, 1833

The genus *Suncus* is represented by a single

species *Suncus murinus* and two subspecies, in Manipur.

Key to the subspecies of *Suncus murinus*

Tail circular in outline, gradually tapering towards tip, inter-spersed with long hairs

..... *S. m. griffithi*

Tail rather long, swollen at base and densely haired

..... *S. m. fulvocinereus*

4. *Suncus murinus griffithi* (Horsfield)

1851. *Sorex griffithi* Horsfield, *Cat. Mammalia Mus. Hon. East-India Co.*, : 134 (Assam, India).

Common name : House Shrew (Eng.).

Material examined : Imphal district : 2♂, 2♀ : On Dimapur Road near Imphal, coll. M. L. Roonwal, 1, 6.viii.1945, 10-11.xi.1945. Churachandpur district : 5♂, 5♀ : Churachandpur, coll. A.K. Poddar, 11-14.iii.1992. Senapati district : 2♂, 2♀ : Turibari (c 1250 m), 5 km W of Kangpokpi, coll. Ajoy Kumar Mandal, 8,12.xi.1992. Ukhrul district : 3♂ : Ukhrul (c 1800 m), coll. Ajoy Kumar Mandal, 14,16.xi.1992. Tamenglong district : 2♂, 6♀ : Tamenglong (c 1280 m), coll. Ajoy Kumar Mandal, 21-24.xi.1992.

Measurements : External : 2♂ : HB 134.0, 123.0; TI 74.0, 75.0; Hf 19.6, 21.2; E 12.8, 12.0. 2♀ : HB 106.0, 92.0, TI 65.0, 72.0; Hf 18.5, 19.0; E 12.0, 11.0. Cranial : 2♂ : l 35.5., 32.5; cb 34.4, 30.8; pl 15.2, 14.4; cw 14.8, 13.2. 2♀ : l 29.9, 31.1; cb 28.5, 30.0; pl 13.3, 13.7; cw 12.0, 12.3.

Diagnosis : Dorsal colour brown with rusty wash; ventral colour lighter; hair thick and long, more than 8.0 mm.

Distribution : India : Manipur : Imphal district, Senapati district, Tamenglong district, Ukhrul district, Churachandpur district; Arunachal Pradesh; Assam; Meghalaya; Nagaland; Uttar Pradesh; West Bengal.

Elsewhere : Bhutan and Bangladesh.

5. *Suncus murinus fulvocinereus* (Anderson)

1877. *Crociodura (Pachyura) fulvocinerea* Anderson, *J. Asiat. Soc. Beng.*, 46 : 263 (Guwahati, Kamrup district, Assam, India).

Common name : House Shrew (Eng.).

Material examined : Imphal district; 5♂, 4♀ : 16 miles N of Imphal on Dimapur Road, coll. M. L. Roonwal, 8-22. xi.1945, 28.xii.1945.

Measurements : None.

Diagnosis : Similar to *Suncus murinus griffithi* in appearance, but tail rather long, swollen at base and densely haired.

Distribution : India : Manipur : Imphal district (Roonwal 1950); Meghalaya; Assam.

Genus *Crociodura* Wagler, 1832

One species of the genus *Crociodura* is found in Manipur.

6. *Crociodura attenuata rubricosa* Anderson

1877. *Crociodura rubricosa* Anderson, *J. Asiat. Soc. Beng.*, 46(2) : 280 (Sibsagar, Sibsagar district, Assam, India).

1877. *Crociodura kingiana* Anderson, *J. Asiat. Soc. Beng.*, 46 : 281 (Mungpo, Darjiling district, West Bengal, India).

Common name : Grey Shrew (Eng.).

Material examined : Ukhrul district : 1♂ : Ukhrul (c 1800 m), coll. Ajoy Kumar Mandal, 17.xi.1992.

Measurements : External : 1♂ : HB 75.0; TI 70.0; Hf 16.5; E 10.0. Cranial : 1♂ : l 21.5.

Diagnosis : Dorsal colour dark or reddish brown, ventral colour grey-brown, with silvery sheen; tail more or less tetragonal, not swollen at base; snout well-clad with hairs; ears sparsely clad with hairs; condylobasal length less than 21.6 mm.

Distribution : India : Manipur : Ukhrul district; Arunachal Pradesh; Assam; Jammu & Kashmir; Meghalaya; Punjab; Uttar Pradesh; West Bengal.

Elsewhere : Bhutan.

Remarks : Anderson (1877, 1881) described *Crociodura kingiana* and synonymised it with *C. rubricosa*. Ellerman and Morrison-Scott (1951) treated both *rubricosa* and *kingiana* as separate subspecies of *C. attenuata*, without assigning any definite reason. On an examination of the type

series of *rubricosa* and *kingiana*, no difference in the external and cranial characters could be detected. Hence, *Crocidura kingiana* is treated here as a synonym of *Crocidura attenuata rubricosa* and this species constitute its first record from Manipur.

Genus *Anourosorex* Milne Edwards, 1872

The genus *Anourosorex* is monotypic.

7. *Anourosorex squamipes* Milne-Edwards

1872. *Anourosorex squamipes* Milne-Edwards, *Rech. Hist. nat. Mammal.* : 264 (probably Moupin, Szechuan, China).

Common name : Szechuan Burrowing Shrew (Eng.).

Material examined : Senapati district : 1♂, 1♀; Turibari (c 1250 m), coll. Ajoy Kumar Mandal, 10.12.xi.1992. Ukhrul district : 2♂, 2♀, Ukhrul (c 1800 m), coll. Ajoy Kumar Mandal, 15.17.xi.1992. Tamenglong district : 4♂, 4♀, Tamenglong (c 1280 m), coll. Ajoy Kumar Mandal, 21-24.xi.1992.

Measurements : External : 2♂ : HB 100.8, 88.5; TI 13.2, 13.5; Hf 15.5, 14.3; E 8.7, 8.5, 2♀ : HB 82.0, 116.0; TI 13.0, 13.0; Hf 16.5, 16.0; E 9.0, 8.5. Cranial : 2♂ : l 26.2, 25.8; cb 24.5, 24.6; pl 11.2, 10.9; cw 14.2, 14.2; mtr 11.9, 11.1. 2♀ : l 25.8, 26.6; cb 24.5, 25.3; pl 11.1, 11.4; cw 13.3, 14.6; mtr 11.5, 11.6.

Diagnosis : Seminude snout; feet naked; tail small, naked and scaly.

Distribution : India : Manipur : Senapati district, Ukhrul district, Tamenglong district; Arunachal Pradesh; Assam; Meghalaya.

Elsewhere : Bhutan, Myanmar, Southern China, Taiwan, Vietnam, Thailand.

Remarks : From the study of specimens from Manipur, it is quite evident that the ranges of the head and body length and the greatest length of the skull covered both the larger and smaller forms from Assam-NEFA and South-eastern China as stated by Mandal and Das (1970). Therefore, in our view Ellerman and Morrison-Scott (1966) were quite justified in synonymizing *assamensis*

with the nominate subspecies, *Anourosorex squamipes squamipes* Milne-Edwards. This species was recorded for the first time from Manipur (Mandal, *et al.* 1974).

Order CHIROPTERA

Order Chiroptera is the only order of mammals which has wings and is capable of true flight.

The order Chiroptera is divided into two suborders.

Suborder MEGACHIROPTERA

Bats of this suborder are characterised by the absence of nose-leaf and tragus; tail reduced, rod-like and often absent.

The suborder Megachiroptera consists of a single family Pteropodidae.

Family PTEROPODIDAE

Five genera of the family Pteropodidae occur in Manipur. Each of the genera is represented by a single species and subspecies.

Key to the genera, species and subspecies of the family PTEROPODIDAE

1. Tongue moderate, usually the tip does not protrude out of the mouth in dead specimen; inner margin of nostril projecting; a claw present on second fore finger 2
- Tongue long, usually a portion of the tip protrudes out of the mouth in dead specimen; no projecting margin of nostril; no claw on second fore finger *Eonycteris spelaea*
2. Upper part of body of one colour throughout 3
- Hind neck and shoulders paler than back *Pteropus giganteus giganteus*
3. Five upper and six lower cheek-teeth *Rousettus leschenaulti leschenaulti*
- Four upper and five lower cheek-teeth 4
4. Two pairs of lower incisors *Cynopterus sphinx sphinx*

— One pair of lower incisor
..... *Megaerops niphanae*

Genus *Rousettus* Gray, 1821

The genus *Rousettus* is represented by a single species and subspecies in Manipur.

8. *Rousettus leschenaulti leschenaulti*
(Desmarest)

1820. *Pteropus leschenaulti* Desmarest, *Encycl. Meth. Mammal.*, 1 : 110 (Environments of Pondicherry, India).

Common name : Indian Fulvous Fruit Bat (Eng.).

Material examined : None.

Measurements : Nil.

Diagnosis : Medium-sized fruit bat, with large eyes and longish muzzle; tail rod-like and reduced; dorsal colour light brown with rufescent tone, ventral colour of lighter shade; back of neck and shoulders sparsely haired; last lower molar elliptical.

Distribution : India : Manipur : Imphal district, Tamenglong district, Senapati district; widely distributed throughout the mainland.

Elsewhere : Pakistan, Nepal, Sri Lanka, Bangladesh, Bhutan, Myanmar, Southern China including Tibet, Hong Kong, Thailand, Laos, possibly Cambodia, and Vietnam.

Remarks : This bat was seen flying in the evening during our field trips to Manipur.

Genus *Pteropus* Brisson, 1762

Only one species and subspecies of the genus *Pteropus* occurs in Manipur.

9. *Pteropus giganteus giganteus* (Brünnich)

1782. *Vespertilio gigantea* Brünnich, *Dyrenes Historie*, 1 : 45 (West Bengal, India).

Common name : Indian Flying Fox (Eng.).

Material examined : Imphal district : 7♂, 4♀, Imphal Town (c 793 m), coll. M.L. Roonwal, 4.ix.1945, 7.xi.1945.

Measurements : None.

Diagnosis : Largest bat of Manipur; rufous-brown around head and neck; an orange band across upper back; lower back blackish brown; ventral parts dark chestnut brown; no external tail; a narrow flap of skin present inside each leg.

Distribution : India : Manipur : Imphal district (Roonwal 1950); widely distributed throughout the Indian union, including Andaman Islands (Mason 1908).

Elsewhere : Pakistan, Sri Lanka, Nepal, Bangladesh and Myanmar.

Genus *Cynopterus* F. Cuvier, 1824

Only one species and subspecies of the genus *Cynopterus* occurs in Manipur.

10. *Cynopterus sphinx sphinx* (Vahl)

1797. *Vespertilio sphinx* Vahl, *Skr. Nat. Selsk. Copenhagen*, 4 (1) : 123 (Tranquebar, Tanjavur district, Tamil Nadu, India).

Common name : Short-nosed Fruit Bat (Eng.).

Material examined : Churachandpur district : 2♂, 1♀, Churachandpur, Coll. A. K. Poddar, 11.12.1992. Imphal district : 4♂, 4♀, Uchathal (c 175 m), 5 km E of Jiribam, coll. A. K. Poddar, 19.20.11.1992; 3♂, 1♀, coll. Ajoy Kumar Mandal, 27.11.1992. Tamenglong district : 1♂, 2♀, Tamenglong (c 1280 m), coll. Ajoy Kumar Mandal, 22.24.11.1992.

Measurements : External : 2♂ : Fa 64.0, 70.5; E 13.5, 22.0; Tb 26.0, 28.6; F & Cl 15.0, 15.5. 2♀ : Fa 70.2, 67.5; E 19.0, 19.0; Tb 27.2, 25.4; F & Cl 12.1, 12.0. Cranial : 2♂ : l 31.6, 33.2; cb 29.7, 30.4; cr 8.3, 8.6; mtr 10.8, 11.3; c¹-c¹ 6.6, 6.7; cw 13.3, 14.3; zw 19.7, 20.7; m³-m³ 9.6, 10.0; ml 23.1, 24.5. 2♀ : l 31.5, 29.7; cb 29.9, 28.5; cr 7.7, 7.0; mtr 10.9, 9.9; c¹-c¹ 6.7, 6.8; cw 13.8, 13.3; zw 19.4, 19.7; m³-m³ 9.4, 9.5; ml 24.9, 22.7.

Diagnosis : Medium-sized fruit bat, with white margin to ears; metacarpals and phalanges whitish; nostrils divergent with deep inter-narial groove; dorsal colour grey or greyish brown, paler ventrally (often with a broad rufescent or chestnut coloured area around shoulders and throat); tail reduced and rod like.

Distribution : India : Manipur : Churachandpur district, Imphal district, Tamenglong district; widely distributed throughout the mainland of Indian Union.

Elsewhere : Pakistan, Sri Lanka, Nepal, Bangladesh and Myanmar.

Genus *Megaerops* Peters, 1865

The genus *Megaerops* is represented by one species in Manipur.

11. *Megaerops niphanae* Yenbutra & Felten

1983. *Megaerops niphanae* Yenbutra & Felten, *Senckenberg. biol.*, **64** : 2 (Sakaerat Environmental Research Station (14°30' N – 101°56' E), Amphoe Pak Thong Chai, Prov. Nakhon Ratchasima, Thailand).

Common name : Niphan's Fruit Bat (Eng.).

Material examined : Tamenglong district : 1♂, Tamenglong (c 1280 m), coll. Ajoy Kumar Mandal, 22.xi.1992. Imphal district : 1♀, Uchathol (c 175 m), coll. Ajoy Kumar Mandal, 28.xi.1992.

Measurements : External : 1♂, 1♀ : Fa 59.4, 59.0; E 19.2, 17.5; Tb 23.0, 22.7; F & Cl 14.0, 14.0. Cranial : 1♂, 1♀ : l 28.0, 26.3; cr 6.3, 6.3; mtr 8.6, 8.3; iw 5.0, 5.0; cw 12.4, 12.0; zw 17.8, 17.6; ml 20.0, 19.0.

Diagnosis : Much like the Short-nosed Fruit bat, but nostrils are more subtubular, no external tail; ears without white edges; wing membranes attached to second phalanx of first toe; colour dusky brown above, light greyish brown below.

Distribution : India : Manipur : Tamenglong district, Imphal district; West Bengal.

Elsewhere : Thailand and Vietnam.

Remarks : Koopman (1989) identified the specimen from Pashok (Darjeeling district, West Bengal) as *Megaerops niphanae* instead of *Megaerops ecaudatus* by Hill (1983). *M. niphanae* is the largest among the four species known of the Indo-Malayam genus *Megaerops*. This species was recorded for the first time from Manipur (Mandal, *et al.* 1993).

Genus *Eonycteris* Dobson, 1873

The genus *Eonycteris* is monotypic.

12. *Eonycteris spelaea* (Dobson)

1871. *Macroglossus spelaeus* Dobson, *Proc. Asiat. Soc. Beng.*, : 105, 106 (Farm Caves, Moulmein, Tenasserim, Myanmar).

Common name : Dobson's Long-tongued Fruit Bat (Eng.).

Material examined : None.

Measurements : Nil.

Diagnosis : Very much like the Indian Fulvous Fruit bat, but second finger lacks a claw; small reniform perianal gland present on either side of anus; fur short and scanty; back brownish, ventral surface rather greyish; adult males with yellowish red buff on neck.

Distribution : India : Manipur : Imphal district (Sinha 1994); Andaman & Nicobar Islands; Andhra Pradesh; Arunachal Pradesh; Assam; Karnataka; Meghalaya; Sikkim; Uttar Pradesh; West Bengal.

Elsewhere : Myanmar, Southern China, Vietnam, Laos, Cambodia, Thailand, Malay Peninsula and nearby Islands, Sumatra and possibly Borneo.

Suborder MICROCHIROPTERA

The suborder Microchiroptera is represented by two families, in Manipur.

Key to the families of the suborder MICROCHIROPTERA

Tail entirely enclosed in inter-femoral membrane.

A. A nose-leaf but no tragus present
..... RHINOLOPHIDAE

B. No nose-leaf but a tragus present
..... VESPERTILIONIDAE

Family RHINOLOPHIDAE

Small to rather large-sized bats with complicated nose-leaf, large ears, small eyes and tail entirely enclosed in inter-femoral membrane (except *Coelops*). The nose-leaf essentially consists of three main portions, *viz.*, anterior rounded horizontal portion popularly called the

horse shoe, the central portion and the posterior vertical portion.

The family Rhinolophidae is represented by one genus in Manipur.

Genus *Hipposideros* Gray, 1831

The genus *Hipposideros* is represented by two species, in Manipur.

Key to the species and subspecies of the Genus *Hipposideros*

- A. Posterior nose-leaf narrower than anterior nose-leaf; a large frontal sac present
..... *Hipposideros armiger armiger*
- B. Posterior nose-leaf not narrower than anterior nose-leaf; a frontal sac absent
..... *Hipposideros lankadiva*

13. *Hipposideros armiger armiger* (Hodgson)

1835. *Rhinolophus armiger* Hodgson, *J. Asiat. Soc. Beng.*, 4 : 699 (Nepal).

Common name : Great Himalayan Leaf-nosed Bat (Eng.).

Material examined : Tamenglong district : 1♀ : Tharon Cave (30 km N of Tamenglong, c 1280 m), coll. Ajoy Kumar Mandal, 23.xi.1992.

Measurements : External : 1♀ : Fa 89.1; E 26.0; Tb 37.6; F & Cl 16.5.

Diagnosis : Largest (forearm may reach 96.0 mm and above) leaf-nosed bat of Manipur; ears large, broad and acutely pointed, slightly thickened at anti-tragal region; nose-leaf with four supplementary leaflets, the fourth rudimentary; upper edge of posterior nose-leaf flattened, thickened and trilobate; frontal sac prominent in males, smaller in females.

Distribution : India : Manipur : Tamenglong district (Mandal, *et al.* 1993); Assam; Meghalaya; Sikkim; Uttar Pradesh; West Bengal.

Elsewhere : Nepal, Myanmar, Southern China, Hong Kong, Vietnam, Thailand, Malay Peninsula, and nearby Islands.

14. *Hipposideros lankadiva* Kelaart

1850.. *Hipposideros lankadiva* Kelaart, *J. Ceylon Brch R. Asiat. Soc.*, 2 : 216 (Kandy, Sri Lanka).

Common name : Sri Lanka Gigantic Leaf-nosed Bat or Kelaart's Leaf-nosed Bat (Eng.).

Material examined : Imphal district : 1♀, Jiribam (c 175 m), coll. A. K. Poddar, 19.iii.1992.

Measurements : External : 1♀ : Fa 86.5; E 24.0; Tb 36.0; F & Cl 15.0. Cranial : 1♀ : l 32.5; mtr 11.7; c¹-c¹ 8.0; iw 3.4; cw 13.7; zw 19.3; ml 23.0.

Diagnosis : Ears large and acutely pointed, posterior margins slightly concave behind tip; nose-leaf has four lateral supplementary leaflets, the fourth much reduced, often absent; posterior nose-leaf high and broad, upper margin semicircular and supported by three septa enclosing small cells.

Distribution : India : Manipur : Imphal district (Mandal, *et al.* 1993); Karnataka; Madhya Pradesh; Maharashtra; Meghalaya; Orissa; West Bengal.

Elsewhere : Sri Lanka.

Remarks : Brosset (1962) considered this species as monotypic. Ellerman & Morrison-Scott (1951) recognised three subspecies of *Hipposideros lankadiva* from the Indian mainland. Hill (1963) has maintained all the mainland subspecies as *lankadiva*.

Family VESPERTILIONIDAE

Bats of the family Vespertilionidae have tragus but no nose-leaf; the tail is approximately as long as the forearm and is enclosed in the interfemoral membrane upto the tip or penultimate joint.

Only one sub-family of the family Vespertilionidae, namely Vespertilioninae, occurs in Manipur.

Subfamily VESPERTILIONINAE

Key to the genera of the subfamily VESPERTILIONINAE

1. Upper premolars 2-2 2
- Upper premolars 1-1 3
2. Outer upper incisor not extending beyond singulum of inner ***Scotozous***

— Outer upper incisor extending distinctly beyond cingulum of inner *Pipistrellus*

3. Upper incisors 2-2 *Tylonycteris*

— Upper incisors 1-1 *Scotophilus*

Genus *Pipistrellus* Kaup, 1829

Two species and subspecies of the genus *Pipistrellus* occur in Manipur.

Key to the species and subspecies of the genus *Pipistrellus*

Forearm less than 29 mm
..... *Pipistrellus mimus*

Forearm more than 29 mm
..... *Pipistrellus coromandra*

The nominate subspecies of *P. coromandra* occurs in Manipur.

15. *Pipistrellus coromandra coromandra* (Gray)

1838. *Scotophilus coromandra* Gray, *Mag. Zool. Bot.*, 2 : 498 (Pondicherry, Coromandel coast, India).

Common name : Indian Pipistrelle (Eng.).

Material examined : None.

Measurements : Nil.

Diagnosis : A small-sized pipistrelle (forearm 31 mm, on average); dorsal fur blackish brown, tips of hairs slightly rufescent; ventral fur slightly paler brown; tragus curving forward and bluntly rounded; calcarial lobe small.

Distribution : India : Manipur : Imphal district; widely distributed in peninsular India, north to Jammu & Kashmir (Sharma & Sharma 1976, Chakraborty 1983); east to north-eastern states including Tripura (Agrawal & Bhattacharyya 1977); also reported from Car Nicobar Island (Bhattacharyya 1977).

Elsewhere : Afghanistan (Meyer-Oehme 1965), Pakistan (Walton 1974), Nepal (Hinton & Fry 1923), Sri Lanka, Bangladesh (Khan 1982).

16. *Pipistrellus mimus* Wroughton

1899. *Pipistrellus mimus* Wroughton. *J. Bombay nat. Hist. Soc.*, 12 : 722 (Maheshkatri, Dangs district, Gujarat, India).

Common name : Indian Pygmy Pipistrelle (Eng.).

Material examined : Imphal district : 1♂, 1♀, near Imphal State Guest House, coll. A. K. Poddar, 11.iii.1992; 12♀, Uchathal (c 175 m), 5 km E of Jiribam, coll. Ajoy Kumar Mandal, 28.xi.1992.

Measurements : External : 1♂ : Fa 28.1; Tl 29.2; E 10.0; Tb 11.5; F & Cl 6.0. 1 ♀ : Fa 29.2; Tl 27.0; E 11.0; Tb 12.0; F & Cl 5.5. Cranial : 1♂ : l 11.1; mtr 3.5; cw 6.2; zw 7.2; iw 3.5; m³-m³ 4.7; c¹-c¹ 3.6; ml 7.5. 1♀ : mtr 3.7; cw 6.4; iw 3.7; m³-m³ 4.8; c¹-c¹ 3.7; ml 7.6.

Diagnosis : Smallest (forearm around 28.0 mm) Pipistrelle of Manipur; fur dense and short; dorsal coloration bistre brown, base of hairs almost black; ventral fur lighter; face, ears and wing-membranes almost black; ears small and scarcely triangular; tragus short and curved forward; post-calcarial lobe-present.

Distribution : India : Manipur : Imphal district; widely distributed throughout the mainland of Indian Union.

Elsewhere : Afghanistan (Meyer-Oehme 1965), Pakistan, Nepal (Hinton & Fry 1923), Sri Lanka, Bangladesh (Khan 1982), Myanmar, Vietnam, Thailand (Lekagul & McNeely 1977).

Remarks : Following recent revisions (Sinha 1980, Hill & Harrison 1987), *Pipistrellus mimus* has been considered as monotypic.

Genus *Scotozous* Dobson, 1875

The genus *Scotozous* is represented by a single species.

17. *Scotozous dormeri* Dobson

1875. *Scotozous dormeri* Dobson. *Proc. zool. Soc. Lond.*, : 373 (Bellary Hills, Bellary district, Karnataka, India).

Common name : Dormer's Bat (Eng.).

Material examined : Imphal district : 1♀, Imphal, coll. A. K. Poddar, 11.iii.1992; 1♀, Uchathol (c 175 m), 5 km E of Jiribam, coll. A. K. Poddar, 20.iii.1992.

Measurements : External : 2♀ : Fa 34.5, 34.5; E 13.0, 12.0; Tb 13.5, 14.5; F & Cl 7.5, 8.0.

Cranial : 2♀ : *l* 12.7, 13.6; *mtr* 4.9, 5.0; *c*¹–*c*¹ 4.7, 4.9; *iw* 3.8, 3.9; *cw* 7.0, 7.4; *zw* (1) 8.9; *m*³–*m*³ 6.1, 6.4; *ml* 10.0, 10.4.

Diagnosis : Very small, similar to Kelaart's Pipistrelle, but second upper incisor very small, not extending beyond cingulum of inner incisor; underparts whitish, often lemon-yellow in live and freshly killed specimens.

Distribution : India : Manipur : Imphal district; widely distributed in the Indian mainland from Jammu & Kashmir (Chakraborty 1983), south at least to Karnataka, and from Gujarat east to West Bengal.

Elsewhere : Pakistan (Roberts 1977), and possibly Taiwan.

Remarks : This constitutes the first record of this bat from Manipur.

Ellerman & Morrison-Scott (1951) recognised two subspecies of *P. dormeri*. But Agrawal (1973) has synonymised *Pipistrellus dormeri caurinus* (Thomas, 1915) with the nominate subspecies.

Genus *Tylonycteris* Peters, 1872

The genus *Tylonycteris* is represented in Manipur by one species and subspecies.

18. *Tylonycteris pachypus fulvida* (Blyth)

1859. *Scotophilus fulvidus* Blyth. *J. Asiat Soc. Beng.*, **28** : 293 (Schwegyin, Sittang river, southeastern Myanmar).

Common name : Club-footed Bat (Eng.).

Material examined : None.

Measurements : Nil.

Diagnosis : Reddish brown above and below; ear shorter, tip rounded; tragus short; fleshy pads at junction of thumb and second finger, and on soles; skull dorsoventrally flattened, braincase and rostrum at same level.

Distribution : India : Manipur (Das, *et al.* 1995); Andaman Islands (Dobson 1876); Karnataka; Kerala; Meghalaya; Sikkim; Tripura; West Bengal.

Elsewhere : Bangladesh (Ahmed & Husain 1982), Myanmar, Southern China, Vietnam, Laos, Thailand (Lekagul & McNeely 1977).

Remarks : The Club-footed Bat has only once been seen at Ukhrul. As such, it appears to be a rare bat of this state.

Genus *Scotophilus* Leach, 1821

The genus *Scotophilus* is represented in Manipur by one species and subspecies.

19. *Scotophilus heathi heathi* (Horsfield)

1831. *Nycticejus heathii* Horsfield. *Proc. zool. Soc. Lond.*, : 113 (Madras, Chennai district, Tamil Nadu, India).

Common name : Greater Yellow Bat (Eng.).

Material examined : Imphal district : 2♂, 4♀, Jiribam (c 175 m), coll. Y.P. Sinha, 2.v.1990.

Measurements : Nil.

Diagnosis : Ears small with rounded tips; tragus semilunar, posterior border convex, anterior border concave, slender tip pointing forward; tip of tail free; fur short, dense and sleek, dorsal colour olive-brown, ventral colour lemon-yellow or orange-yellow.

Distribution : India : Manipur : Imphal district; widely distributed throughout the Indian mainland, east at least to Tripura.

Elsewhere : Afghanistan (Meyer-Oehme 1965), Pakistan, Nepal (Agrawal & Chakraborty 1971), Sri Lanka, Bangladesh (Hutton 1872), and Myanmar.

Remarks : Ellerman & Morrison-Scott (1951) have recognised two subspecies of the Greater Yellow Bat, viz. *S. h. heathi* and *S. h. belangeri* (I. Geoffroy, 1834), for the Indian populations. Siddiqi (1961) has synonymised *belangeri* with the nominate subspecies.

Order PRIMATES

Primates, evolved from arboreal ancestors, hence retain this characteristic in prehensile hands and feet, the thumb and big toe opposable to other digits; each digits tipped with a flat nail. Other characters include an increase in the size and complexity of brain; complete bony rim around orbits; reduced dentition; complete set of collar bones; well developed brain.

Three families of the order Primates occur in Manipur.

**Key to the families of the
Order PRIMATES**

1. Fore limbs much longer than hind, tail absent
..... HYLOBATIDAE
- Fore limbs not longer than hind, tail present
..... 2
2. All digits with nails....CERCOPITHECIDAE
- Second digit of hind limb with small claw ..
..... LORISIDAE

Family LORICIDAE

One genus of the family Loricidae occurs in Manipur.

Genus *Nycticebus* E. Geoffroy, 1812

One species and subspecies of the genus *Nycticebus* occurs in Manipur.

**20. *Nycticebus coucang bengalensis*
(Lacépède)**

1800. *Loris bengalensis* Lacépède, *Seances des Écoles normales*, Tome, 8 : 68 (Bengal).

Common name : Slow Loris (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : About the size of a half-grown cat; with short ears and stumpy tail almost hidden in thick fur; fur varies in colour; brown ring round the eyes; brown streak on crown and back.

Distribution : India : Manipur : Chandel district; Arunachal Pradesh; Assam; Meghalaya; Mizoram; Nagaland.

Elsewhere : Bangladesh, Myanmar and Thailand.

Remarks : Information regarding occurrence of slow Loris at Chandel district was collected from local inhabitants during recent survey trips there. Ramakantha (1991) reported its occurrence in Manipur but did not mention any locality.

Family CERCOPITHECIDAE

In Manipur, the family Cercopithecidae is represented by two genera.

**Key to the genera of the family
CERCOPITHECIDAE**

- Cheek-pouches present; tail generally smaller than head and body; face reddish.....
..... *Macaca*
- Cheek-pouches absent; tail always longer than head and body; face blackish.....
..... *Presbytis*

Genus *Macaca* Lacépède, 1799

Three species of the genus *Macaca* occur in Manipur.

Key to the species of the genus *Macaca*

1. Tail inconspicuous, reduced to a stump and seldom longer than 30.0 mm *M. arctoides*
- Tail conspicuous, generally about half the length of head and body 2
2. Hindquarter of the body brighter (of orange-red hue) than the forequarter; buttocks naked around ischial callosities *Macaca mulatta*
- Hindquarter of body not more brightly coloured than the forequarter; buttocks clad up to the edge of callosities *Macaca assamensis*

***Macaca mulatta* (Zimmermann)**

The nominate subspecies of *Macaca mulatta* occurs in Manipur.

21. *Macaca mulatta mulatta* (Zimmermann)

1780. *Cercopithecus mulatta* Zimmermann, *Geogr. Gesch. Mensch.*, 2 : 195 (India).

Common name : Rhesus Macaque (Eng.).

Material examined : Imphal district : 1♀, 6 km N of Imphal on Dimapur Road, coll. M. L. Roonwal, 6.xi.1945.

Measurements : External : 1♀ : HB 460; TI 225; Hf 140; E 35.

Diagnosis : Medium-sized, with a short tail (about half of the head and body length). Face light pink. Crown hairs grow back from brows. Upper back olive in colour; loins, rump and base of tail of orange-red hue, face flesh-coloured.

Distribution : India : Manipur : Imphal district (Roonwal 1950); Andhra Pradesh; Arunachal Pradesh; Assam; Bihar; Delhi; Gujarat; Himachal Pradesh; Jammu & Kashmir; Madhya Pradesh; Meghalaya; Orissa; Punjab; Rajasthan; Sikkim; Tripura (Agarwal & Bhattacharyya 1977), Uttar Pradesh; West Bengal.

Elsewhere : Bhutan, Bangladesh, Myanmar, China, Thailand and Vietnam.

Remarks : The Rhesus Macaque, though common in other parts of India, is rather uncommon in Manipur as noticed during recent surveys.

***Macaca assamensis* (M'clelland)**

The nominate subspecies of *Macaca assamensis* occurs in Manipur.

22. *Macaca assamensis assamensis* (M'Clelland)

1839. *Macacus assamensis* M'Clelland, in Horsfield, *Proc. zool. Soc. Lond.*, 148 (Assam).

Common name : Assamese Macaque (Eng.).

Material examined : Imphal district : 1 sub.ad.♂, Imphal valley c 7 km N of Imphal on Dimapur Road (c 914 m), coll. M.L. Roonwal, 6.xi.1945.

Measurements : External : 1 sub ad. ♂, HB 410; TI 201; Hf 137; E 38.

Diagnosis : Almost like the Rhesus Macaque, but distinguished by absence of orange-red hue on loins and rump.

Distribution : India : Manipur : Imphal district (Roonwal 1950); Arunachal Pradesh; Assam; Meghalaya; Nagaland.

Elsewhere : Bangladesh, Myanmar, east to Vietnam, Southern China.

Remarks : During recent surveys a troop of about sixty monkeys of this species was observed around a temple near Imphal town.

23. *Macaca arctoides* (I. Geoffroy)

1831. *Macacus arctoides* I. Geoffroy, *Zool. Voy de Belanger Indes Orient.*, : 61 (Indochina).

Common name : Stump-tailed Macaque (Eng.).

Material examined : None.

Measurements : Nil.

Diagnosis : Tail stump-like, almost naked, not more than 50 mm in length. Colour of body dark brown, with bare red face.

Distribution : India : Manipur : Chandel district; Arunachal Pradesh; Assam; Meghalaya.

Elsewhere : Myanmar, southern China, erstwhile Indochina, northern Malay Peninsula.

Remarks : A troop of five Stump-tailed Macaques were seen near Moreh on the Indo-Burma border. However, it is rare in Manipur.

Genus *Presbytis* Eschscholtz, 1821

One species of the genus *Presbytis* occurs in Manipur.

***Presbytis pileatus* (Blyth)**

Only the nominate subspecies of *Presbytis pileatus* occurs in Manipur.

24. *Presbytis pileatus pileatus* (Blyth)

1843. *Sennopithecus pileatus* Blyth, *J. Asiat. Soc. Beng.*, 12 : 174. (Locality unknown).

Common name : Capped Monkey (Eng.).

Material examined : Senapati district : 1♂, Kalanaga Barcil Range, coll. ZSI party, ...ii.1936

Measurements : Nil.

Diagnosis : A slender-build monkey, with a crown of erect, long hairs, directed backwards from forehead; colour dark grey on back and limbs, yellowish white on cheeks and underparts.

Distribution : India : Manipur : Senapati district; Assam; Meghalaya; Nagaland.

Elsewhere : Bangladesh.

Remarks : The Capped Monkey is very rare in Manipur.

Family HYLOBATIDAE

The family Hylobatidae consists of the lone genus *Hylobates*. It is the only ape found in India.

Genus *Hylobates* Illiger, 1811

Only one species of the genus *Hylobates* occurs in Manipur.

25. *Hylobates hoolock* (Harlan)

1834. *Simia hoolock* Harlan, *Trans. Am. phil. Soc.*, 4 : 52 (Garo Hills, Meghalaya, India).

Common name : Hoolock Gibbon (Eng.).

Material examined : Senapati district : 1♂, Kalanaga Barcil Range, coll. ZSI party, –.ii.1936.

Measurements : Nil.

Diagnosis : Body devoid of a tail; head and body length about 600 mm; arms much longer than the legs; males black, adult females yellowish-grey; eye-brows white.

Distribution : India : Manipur : Senapati district; Assam; Meghalaya; Tripura.

Elsewhere : Bangladesh, Myanmar and China.

Remarks : The Hoolock Gibbon is not common in Manipur.

Order PHOLIDOTA

Elongated, tapering body; dorsal area of head, body and tail covered with large overlapping scales; ventral surface covered with coarse, bristly hairs; limbs short; toes with powerful claws; jaws devoid of teeth; vermiform tongue, highly protrusible.

Order Pholidota consists of a single family Manidae.

Family MANIDAE

The family Manidae consists of only one genus, *Manis*.

Genus *Manis* Linnaeus, 1758

One species and subspecies of the genus *Manis* occurs in Manipur.

26. *Manis pentadactyla aurita* Hodgson

1836. *Manis auritus* Hodgson, *J. Asiat. Soc. Beng.*, 5 : 234 (lower and central Nepal).

Common name : Chinese Pangolin (Eng.).

Material examined : None.

Measurements : Nil.

Diagnosis : Body covered with 15-18 rows of longitudinal overlapping scales; dark brown in colour; bare skin of ventral surface flesh-coloured.

Distribution : India : Manipur : Chandel district, Senapati district; Assam; Meghalaya; Nagaland.

Elsewhere : Nepal, Myanmar and southern China.

Remarks : The Chinese Pangolin was observed at night in the hilly jungles of Chandel and Turibari during recent surveys.

Order CARNIVORA

Six small, equal-sized incisors; a pair of large conical canines; last upper premolar and first lower molar, having sharp edged lobes, developed into carnassial (flesh-cutting) teeth.

Six families of the Order Carnivora occur in Manipur.

Key to the families of the order
CARNIVORA

1. Bulla much dilated, rounded, but not divided into chambers by a septum CANIDAE
- Bulla much dilated, rounded, but divided into chambers by a septum 2
- Bulla not rounded but inflated, and not divided by a septum 4
2. 3-4 teeth in upper molar series of each jaw; toes 5-4; claws curved, sharp and retractile; head short and some-what roundish, with shortened muzzle FELIDAE
- 6 teeth in molar series of each jaw (except *Prionodon*); toes usually 5-5; claws variable; head elongated 3
3. Ears moderate in size, with well-developed

bursa; auditory bulla oval or subconical; no bony tube to auditory orifice; claws curved and more or less retractile; pre-scrotal gland generally present VIVERRIDAE

— Ears small and rounded, with vestigial bursa; auditory bulla somewhat pear-shaped; a well-developed bony tube to the auditory orifice; claws lengthened, exerted, non-retractile; pre-scrotal gland absent HERPESTIDAE

4. True molars 1-1 in upper jaw, 2-2 in lower jaw; MUSTELIDAE

— True molars 2-2 in upper jaw, 3-3 in lower jaw URSIDAE

Family CANIDAE

Family Canidae is represented by two genera and two species in Manipur.

Key to the genera and species of the family CANIDAE

1. A frontal sinus present; post-orbital process smooth and convex above; tail less than half the length of head and body *Canis* (*C. aureus*)

— No frontal sinus; postorbital process concave above; tail more than one-half the length of head and body *Vulpes* (*V. bengalensis*)

Genus *Canis* Linnaeus, 1758

One species of the genus *Canis* occurs in Manipur and is represented by one subspecies.

27. *Canis aureus indicus* Hodgson

1833. *Canis aureus indicus* Hodgson, *Asiat. Res.*, 18, 2 : 237 (Nepal).

Common name : Asiatic Jackal (Eng.).

Material examined : Imphal district : 1♀, Imphal Valley (North of Imphal on Dimapur Road); 14.xi.1945; 1♀, Imphal Valley (south-east of Imphal, c 914 m), 4.xii.1945; coll. M. L. Roonwal.

Measurements : External : 2♀ : HB 675, 720; TI 175, 188; Hf 142, 150; E 73, 74.

Diagnosis : Smaller than wolf; lacks the arching brows and elevated forehead. Dorsal colour typically a mixture of black and white, washed with buff at the shoulders, ears and legs.

Distribution : India : Manipur : Imphal district (Roonwal 1950), Ukhrul district, Chandel district; Arunachal Pradesh; Assam; Bihar; Meghalaya; Nagaland; Sikkim; Tripura; West Bengal.

Elsewhere : Bhutan, Myanmar and Thailand.

Remarks : Asiatic Jackals were seen at Ukhrul and Chandel districts during recent survey trips.

Genus *Vulpes* Oken, 1816

One species of the genus *Vulpes* occurs in Manipur.

28. *Vulpes bengalensis* (Shaw)

1800. *Canis bengalensis* Shaw, *Gen. Zool.*, 1(2) : 330 (Bengal).

Common name : Bengal Fox (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : A grey-coloured, slender-limbed animal; back of ears sandy brown; tail-tip black.

Distribution : India : Manipur : Chandel district, Imphal district, Senapati district; occur throughout India.

Elsewhere : Pakistan, Nepal and Bangladesh.

Remarks : The Bengal Fox is not very common in Manipur. One specimen each was, however, seen at Chandel, Turibari and Jiribam, during recent survey trips.

Family FELIDAE

One genus of the family Felidae namely *Felis* occurs in Manipur.

Genus *Felis* Linnaeus, 1758

Two species of the genus *Felis* occur in Manipur.

Key to the species of the genus *Felis*

— Outer chamber of bulla relatively large,

partition arising from some distance of orifice; tip of postorbital process about the middle of skull *F. chaus*

— Outer chamber of bulla small, partition arising close to orifice; tip of postorbital process in front of the middle of skull ... *F. bengalensis*

29. *Felis chaus* Güldenstaedt

1776. *Felis chaus* Güldenstaedt, *Nov. Com. Acad. Petrop.*, 20 : 483 (Terak river, north of Caucasus).

Common name : Jungle Cat (Eng.).

Material examined : Senapati district : 1♂, 1♀, Imphal valley, c 1067 m, 30 Km N of Imphal, coll. M. L. Roonwal, 29.30.xi.1945. Imphal district : 1♂, Imphal Valley, c 1067 m, 16 km SE of Imphal on Imphal-Palel Road, Coll. M. L. Roonwal, 4.xii.1945.

Measurements : External : 1♂ : HB 655; TI 215; HF 147; E 73. 1♀ : HB 615; TI 245; HF 140; E 75.

Diagnosis : Medium-sized, head and body 60-75 cm in length; tail shorter, tipped black; general colour light reddish-grey, unspotted except on lower flanks and elbow; black horizontal stripes present on inner side of fore-legs; ears reddish chestnut with rudimentary hair tuft.

Distribution : India : Manipur : Senapati district, Imphal district (Roonwal 1950); Arunachal Pradesh; Assam; Himachal Pradesh; Jammu & Kashmir; Meghalaya; Nagaland; Sikkim; Uttar Pradesh; West Bengal.

Elsewhere : Nepal.

Remarks : Jungle Cat is not common in Manipur and not a single specimen could be seen during recent survey trips.

30. *Felis bengalensis bengalensis* Kerr

1792. *Felis bengalensis* Kerr., *Anim. Kingd.* 151. (Southern Bengal).

Common name : Leopard Cat (Eng.).

Material examined : Imphal district : 1♂, Kangla Tongbi, c 1068 m, 17 km N of Imphal on Dimapur road, coll. M.L. Roonwal, 28.xi.1945.

Measurements : External : 1♂ : HB 465; TI 250; HF 106; E 46.

Diagnosis : Colour variable, pelage ornamented with blackish brown spots; back of ears black, with a whitish round spot in the centre; four longitudinal black bands run from forehead to neck, break up into short bands or elongated spots on shoulders; tail spotted above.

Distribution : India : Manipur : Imphal district (Roonwal 1950); Andhra Pradesh; Arunachal Pradesh; Assam; Maharashtra; Meghalaya; Nagaland; Orissa; Karnataka; Kerala; Tamil Nadu; Tripura; West Bengal.

Elsewhere : Bangladesh, Myanmar, Thailand, Yunnan and erstwhile Indo-China.

Remarks : Not a single specimen could be seen during recent survey trips.

Family HERPESTIDAE

The family Herpestidae is represented, in Manipur, by a single genus *Herpestes*.

Genus *Herpestes* Illiger, 1811

The genus *Herpestes* is characterised by its elongated body and short, rounded ears, mostly concealed by hairs; contour hairs banded with pale and darker annulations, giving a speckled appearance; post-dental part of palate extending to back side halfway over the mesopterygoid fossa.

Two species of the genus *Herpestes* occur in Manipur.

Key to the species of the genus *Herpestes*

- A conspicuous white stripe present on the sides of the neck *H. urva*
- Absence of any stripe on sides of neck; muzzle dark brown *H. auropunctatus*

31. *Herpestes urva* (Hodgson)

1836. *Gulo urva* Hodgson, *J. Asiat. Soc. Beng.*, 5 : 238 (Nepal).

Common name : Crab-eating Mongoose (Eng.).

Material examined : Senapati district : 1♀, Modbung Village (c 1067 m), 26 km N of Imphal on Dimapur Road, coll. M. L. Roonwal, 1.xii.1945.

Measurements : External : 1♀ : HB 400; TI 258; HF 90; E 25.

Diagnosis : A white stripe present on each side of the neck running upto shoulders; fur, coarse, ragged, dusky iron-grey in colour; under fur woolly, dark brown at base, brownish-yellow at tips.

Distribution : India : Manipur : Senapati district (Roonwal 1950); Arunachal Pradesh; Assam; Meghalaya; Nagaland; Tripura; West Bengal.

Elsewhere : Bangladesh, Myanmar, Thailand, China, Taiwan and Vietnam.

Remarks : Crab-eating Moongoose is not common at present and not a single specimen was seen during recent survey trips there.

32. *Herpestes auropunctatus* (Hodgson)

1836. *Mangusta auropunctata* Hodgson, *J. Asiat. Soc. Beng.*, 5 : 235 (Nepal).

Common name : Small Indian Mongoose (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Sleek in appearance; about 25 cm in head and body length; tail shorter than head and body; fur, soft, silky, olive-brown to golden in colour.

Distribution : India : Manipur : Senapati district, Chandel district, Churachandpur district, Imphal district, Bishenpur district; Assam; Bihar; Gujarat; Madhya Pradesh; Meghalaya; Orissa; Sikkim; Uttar Pradesh; West Bengal.

Elsewhere : Nepal, Bhutan and Bangladesh.

Remarks : Small Indian Mongoose appears to be very common and was observed at Chandel, Turibari, Churachandpur, Toubal and Jiribam during recent survey trips.

Family MUSTELIDAE

Four genera belonging to family Mustelidae occur in Manipur.

Key to the genera of the family MUSTELIDAE

1. Body long and slender; limbs short; ears small; claws short, sharp and partially retractile; metatarsal pads absent 2
- Body stout, bear-like; feet broad; claws strong, long and non-retractile; metatarsal pads present 3
2. Muzzle, limbs and tail longer; body less elongated and cylindrical; ears larger; total 38 teeth in upper and lower jaws *Martes*
- Muzzle, limbs and tail shorter; body more elongated and cylindrical; ears smaller; total 34-36 teeth in upper and lower jaws *Mustela*
3. Smaller animals; head and body under 400 mm; distinctive black and white facial marks; ears with bursa; feet narrower; plantar pads strongly arched *Melogale*
- Larger animals; head and body over 550 mm; poorly marked facial marks; ears without bursa; feet broader and plantigrade; plantar pads not arched *Arctonyx*

Genus *Martes* Pinel, 1792

The genus *Martes* is represented by one species and subspecies in Manipur.

33. *Martes flavigula flavigula* (Boddaert)

1785. *Mustela flavigula* Boddaert, *Elench. Anim.*, 88 (locality unknown, traditionally fixed as Nepal).

Common name : Yellow-throated Marten (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Head and body length 40-65 cm, with equally long bushy tail; colour variegated; the crown, nape and extremities black; throat and cheeks white; chest yellow; rest of the coat light brown.

Distribution : India : Manipur : Chandel district, Imphal district; Arunachal Pradesh; Assam; Himachal Pradesh; Jammu & Kashmir;

Meghalaya; Nagaland; Sikkim; Uttar Pradesh; West Bengal.

Elsewhere : Afghanistan, Pakistan, Nepal, Bhutan, Myanmar and China.

Remarks : Yellow-throated Marten was seen at Chandel and Uchathol during survey trips.

Genus *Mustela* Linnaeus, 1758

One species of the genus *Mustela* occurs in Manipur.

34. *Mustela kathiah* Hodgson

1835. *Mustela (Putorius) kathiah* Hodgson, *J. Asiat. Soc. Beng.*, 4 : 702 (The Kachar, northern region of Nepal.).

Common name : Yellow-bellied Weasel (Eng.).

Material examined : Nil.

Measurement : None.

Diagnosis : Small, about 280 mm in head and body length. Coat dark chocolate-brown above, and rich yellow below. Tail not bushy.

Distribution : India : Manipur : Senapati district; Arunachal Pradesh; Assam; Meghalaya; Nagaland; Sikkim; Uttar Pradesh; West Bengal.

Elsewhere : Bhutan, Myanmar and China.

Remarks : Yellow-bellied Weasel is not common in Manipur. Two specimens were seen during recent survey trips there, one at Senapati (on Dimapur-Imphal Road) and the other near None (on Silchar-Imphal Road).

Genus *Melogale* I. Geoffroy, 1831

One species and subspecies of the genus *Melogale* occurs in Manipur.

35. *Melogale moschata millsii* (Thomas)

1922. *Helictis millsii* Thomas, *J. Bombay nat. Hist. Soc.*, 28 : 432 (Mokokchung, c 1524 m, Naga Hills, Nagaland).

Common name : Chinese Ferret-Badger (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Coat deep purplish grey to brown; light facial markings and under side yellowish or

buffy-white; narrow whitish stripe runs from the crown of the head down the middle of the back to belly; molar teeth small and narrow-crowned.

Distribution : India : Manipur : Chandel district (Ramakantha 1992); Nagaland.

Elsewhere : Northern Myanmar.

Remarks : During recent survey trips, a specimen of the species was found crossing the road while returning back to Chandel from Moreh at night.

Genus *Arctonyx* F. Cuvier, 1825

One species and subspecies of the genus *Arctonyx* occurs in Manipur.

36. *Arctonyx collaris collaris* F. Cuvier

1825. *Arctonyx collaris* F. Cuvier, *Hist. Nat. Mamm.*, 3(51), (Bhutan Duars, Jalpaiguri district, West Bengal, India).

Common name : Hog-Badger (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Short-tailed animal; head and body length 55-70 cm; squat bear-like body; snout long, like that of a pig; legs stumpy, claws powerful; coat coarse, grey, and rough; head with longitudinal black streaks.

Distribution : India : Manipur : Chandel district, Imphal district; Arunachal Pradesh; Assam; Meghalaya; Nagaland; Sikkim; West Bengal.

Elsewhere : Nepal and Bangladesh.

Remarks : Two specimens of this species could be seen during the recent surveys, one at Chandel and the other at Jiribam.

Family URSIDAE

One genus of the family Ursidae occurs in Manipur.

Genus *Selenarctos* Heude, 1901

The genus *Selenarctos* is represented in Manipur by one species.

37. *Selenarctos thibetanus* (G. Cuvier)

1823. *Ursus thibetanus* G. Cuvier, *Ossements Foss.*, 4 : 325 (Sylhet, Bangladesh).

Common name : Asiatic Black Bear (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Large-sized bear, 140-190 cm in head and body length; coat short, smooth and black; claws black; a white or buff coloured V-shaped breast patch present.

Distribution : India : Manipur : Ukhrul district (Ramakantha 1991), Churachandpur district (Ramakantha 1991); Jammu & Kashmir; Meghalaya; Mizoram; Sikkim; Uttar Pradesh; West Bengal.

Elsewhere : Pakistan and Bangladesh.

Family VIVERRIDAE

Four genera of the family Viverridae occur in Manipur.

Key to the genera of the family
VIVERRIDAE

1. Feet terrestrial and digitigrade; carpal pad single; metacarpal pads absent; scent glands opening into highly specialised pouches 2
- Feet scansorial and semi-plantigrade; carpal and metacarpal pads double; glandular pouches less specialised 3
2. Anterior edge of ears widely separated due to broad forehead; a dorsal crest of hairs extends posteriorly at least from shoulders ... *Viverra*
- Anterior edge of ears set close together due to narrow forehead; no dorsal crest of long hairs *Viverricula*
3. A definite pattern of dorsal stripes and lateral spots present at least in new coat.....
- *Paradoxurus*
- No stripes or spots present..... *Paguma*

Genus *Viverra* Linnaeus, 1758

One species and subspecies of the genus *Viverra* occurs in Manipur.

38. *Viverra zibetha zibetha* Linnaeus

1758. *Viverra zibetha* Linnaeus, *Syst. Nat.* 10th ed., 1 : 44 (India).

Common name : Large Indian Civet (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Markings of body indistinct and cloudy; complete dark and light rings on tail; crest of long, black, erectile hairs present on the back; anterior upper molar distinctly triangular.

Distribution : India : Manipur : Chandel district; Arunachal Pradesh; Assam; Bihar; Madhya Pradesh; Meghalaya; Mizoram; Nagaland; Sikkim; Tripura; West Bengal.

Elsewhere : Bangladesh, Myanmar, Thailand, Vietnam, Malaysia and Singapore.

Remarks : A single specimen was seen during the night on way to Chandel from Moreh.

Genus *Viverricula* Hodgson, 1838

One species and subspecies of the genus *Viverricula* occurs in Manipur.

39. *Viverricula indica indica* (Desmarest)

1817. *Viverra indica* Desmarest, *Nouv. Dict. nat. Hist.*, 7 : 170 (India).

Common name : Small Indian Civet (Eng.).

Material examined : Imphal district : 1 ♀, at milestone 18, SE of Imphal on Imphal-Palel-Tamu Road; coll. M. L. Roonwal; 9.xii.1945.

Measurement : External : 1♀ : HB 483; TI 315; Hf 84; E 36.

Diagnosis : Body pattern consists of small spots on the fore-quarters, larger spots tending to run into longitudinal lines on the flanks, and form six to eight stripes down the back; tail ringed with black and white; muzzle short and weak; no dorsal crest of long hairs on back; claws unprotected by sheaths of skin.

Distribution : India : Manipur : Imphal district (Roonwal 1950); Andhra Pradesh; Arunachal Pradesh; Assam; Bihar; Goa; Gujarat; Himachal Pradesh; Jammu & Kashmir; Karnataka; Kerala;

Madhya Pradesh; Maharashtra; Meghalaya; Orissa; Sikkim; Tamil Nadu; Tripura; Uttar Pradesh; West Bengal.

Elsewhere : Sri Lanka, Bhutan and Bangladesh.

Remarks : A single specimen was seen at Uchathol during the recent survey.

Genus *Paradoxurus* Cuvier, 1821

One species of the genus *Paradoxurus* occurs in Manipur.

40. *Paradoxurus hermaphroditus* (Pallas)

1777. *Viverra hermaphrodita* Pallas, In Schreber, *Die Säügethiere*, 3 : 426 (India).

Common name : Common Palm Civet, Toddy Cat (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : About 55 cm in head and body length, with tail nearly as long; fur long, coarse and ragged, an indistinct mixture of black and grey; muzzle and extremities blackish; young often spotted or striped.

Distribution : India : Manipur : Imphal district; widely distributed throughout India.

Elsewhere : Sri Lanka, China, Malaysia, Indonesia and Philippines.

Remarks : A single specimen was seen at Uchathol during recent survey trips to that area.

Genus *Paguma* Gray, 1831

One species and subspecies of the genus *Paguma* occurs in Manipur.

41. *Paguma larvata neglecta* Pocock

1934. *Paguma larvata neglecta* Pocock, *J. Bombay nat. Hist. Soc.*, 37 : 334 (Mokokchung, c 1372 m, Naga Hills, Nagaland, India).

Common name : Masked Palm Civet (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Absence of spots or stripes on body and presence of white whiskers distinguishes it from other Indian civets. Coat colour grey to

tawny; underparts white. A white band on forehead, nose, and beneath ears; a blotch below eyes.

Distribution : India : Manipur : Chandel district; Assam; Meghalaya; Nagaland; Sikkim.

Elsewhere : Myanmar.

Remarks : A single specimen was seen at Chandel during recent survey trip to that area.

Order ARTIODACTYLA

Animals belonging to this order are even-toed; axis of foot passes between third and fourth toes; toes enclosed in horny hooves of approximately equal size and gives the appearance of a single hoof, split down in the middle.

The order is represented by two families in Manipur.

Key to the families of the Order ARTIODACTYLA

- Upper incisors present; animals devoid of horns and antlers SUIDAE
- Uppers incisors absent; antlers present, at least in males CERVIDAE

Family SUIDAE

The family Suidae is represented in India by a single genus, *Sus* Linnaeus, 1758; and by a single species, *Sus scrofa* Linnaeus, 1758 (subspecies *S. scrofa cristatus* Wagner) in Manipur.

42. *Sus scrofa cristatus* Wagner

1839. *Sus cristatus* Wagner, *Munch. Gelehr. Anz.*, 9 : 435 (Probably Malabar Coast, India).

Common name : Wild Boar (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Coat coarse, a crest of black bristle present from nape to back; tail long, thin, fringed at tip, reaching nearly to hocks; coat in young striped dark brown lengthwise, with buff.

Distribution : India : Manipur : Chandel district; Senapati district; Imphal district; throughout India in forested tracts.

Elsewhere : Pakistan, Sri Lanka, Nepal, Bangladesh, Myanmar, Indonesia, Malaysia and Vietnam.

Remarks : Wild Boar is now rare in Manipur. The main reason of its decline is poaching for flesh.

Family CERVIDAE

Two genera of the family Cervidae occur in Manipur.

Key to the genera of the family CERVIDAE

Upper canine tusk-like in males; antlers short, consisting of a short brow-tine and an unbranched beam *Muntiacus*

Upper canine, when present, not tusk-like; antlers long and branched *Cervus*

Genus *Muntiacus* Rafinesque, 1815

One species and subspecies of the genus *Muntiacus* occurs in Manipur.

43. *Muntiacus muntjak vaginalis* (Boddaert)

1785. *Cervus vaginalis* Boddaert, *Elench. Anim.*, 1 : 136 (Bengal).

Common name : Barking Deer (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Antlers small, consisting of a short brow-tine and an unbranched beam, placed on hairy bony pedicel, which extend down on either side of the face as bony ridges; coat deep chestnut in colour, darker on the back, paler below, with black streaks along the face-ridges; throat, groin, and under-side of tail white.

Distribution : India : Manipur : Imphal district; Arunachal Pradesh; Assam; Bihar; Meghalaya; Sikkim; Tripura; Uttar Pradesh; West Bengal.

Elsewhere : Bhutan, Bangladesh, northern Myanmar, Yunnan, northern Vietnam.

Remarks : Roonwal (1950) observed Barking Deer to be very common at Kanglatongbi village near Imphal during 1945. Now a days it is very rare in Manipur probably due to poaching for flesh.

Genus *Cervus* Linnaeus, 1758

One species and subspecies of the genus *Cervus* occurs in Manipur.

44. *Cervus eldi eldi* M'Clelland

1842. *Cervus eldii* M'Clelland, *Calcutta J. N. H.*, 2 : 417. (Manipur, India).

Common name : Thamin or Brow-antlered Deer (Eng.); Sangnai, Sangai, Sanghai (Manipuri).

Material examined : Nil.

Measurements : None.

Diagnosis : A long muzzled deer (head over 90 cm); coat coarse and sparse, shaggy in winter; its colour varies seasonally, dark brown in winter, yellowish brown in summer; tail with black mark along the top; the antlers looks like a letter 'C' tip of brow-tine to the point of beam is in one continuous curve; number of terminal tines varies from two to ten; fawns are spotted.

Distribution : India : Manipur : Bishenpur district.

Remarks : The distribution of this beautiful deer, in Manipur, is restricted to Keibul Lamjao National Park where they are being conserved. During recent survey trip there a group of one stag and five females were seen grazing.

Order RODENTIA

Rodents are worldwide in distribution. They are characterised by the presence of a pair of chiselshaped incisors in each jaw and a distinct diastema between incisors and cheek-teeth. In Manipur they are represented by four families.

Key to the families of the Order RODENTIA

1. Fur modified into quills or long stiff hairs; Cheekteeth 4/4 in number ... HYSTRICIDAE

- Fur not modified into quills 2
- 2. Skull with distinct postorbital process; premolars two on each side in upper jaw, except in the genus *Ratufa*, only one in the lower SCIURIDAE
- Skull with no postorbital process; premolars absent 3
- 3. Slender in form; tail long, scaly and clothed with short hairs MURIDAE
- Form heavy, cylindrical, mole-like; tail short or rudimentary, almost naked and not scaly; limbs short RHIZOMYIDAE

Family SCIURIDAE

Seven genera of the family Sciuridae occur in Manipur.

Key to the genera of the family SCIURIDAE

- 1. Flying membrane present on both sides of the body 2
- Flying membrane absent 4
- 2. Surface-pattern of lower molar teeth simple and possesses a central depression *Hylopetes*
- Surface-pattern of lower molar teeth excessively wrinkled, and lacks a central depression 3
- 3. Interfemoral membrane absent; ear-tufts present; size small, less than 200 mm in head and body length *Belomys*
- Interfemoral membrane present; ear-tufts absent; size large, more than 300 mm in head and body length *Petaurista*
- 4. Size large, over 280 mm in head and body length; maxillary teeth 4 in number .. *Ratufa*
- Size small, less than 280 mm in head and body length; maxillary teeth 5 in number .. 5
- 5. Dorsal surface of body prominently striped; stripes more than one in number; median stripes of body black *Tamias*
- Dorsal surface of body unstriped or with a faint black stripe 6
- 6. Length of nasal exceeds interorbital width of skull *Dremomys*
- Length of nasal does not exceed interorbital width of skull *Callosciurus*

Genus *Belomys* Thomas, 1905

One species and subspecies of the genus *Belomys* occurs in Manipur.

45. *Belomys pearsoni trichotis* Thomas

1908. *Belomys trichotis* Thomas, *Ann. Mag. nat. Hist.*, 1 : 7 (Machi, Manipur, India).

Common name : Hairy-footed Flying Squirrel (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Dorsal colour dark brown to reddish brown, grizzled, with profuse white tipped hairs; underside, including the chest, white; tuft of long hairs at base of each ear-conch; upper cheek-tooth-row 9 mm or less.

Distribution : India : Manipur : Chandel district (Ellerman & Morrison-Scott 1966).

Elsewhere : Myanmar, and erstwhile northern Indo-China.

Remarks : During recent survey trips a specimen of this species was seen at Turibari, Senapati district, during night when it managed to avoid the mist nets placed for collection of bats.

Genus *Petaurista* Link, 1795

One species and subspecies of the genus *Petaurista* occurs in Manipur.

46. *Petaurista alborufus candidulus* Wroughton

1911. *Petaurista candidulus* Wroughton, *J. Bombay nat. Hist. Soc.*, 20(4) : 1014, 1022 (Kindat, western Myanmar).

Common name : Red-and-White Flying Squirrel (Eng.).

Material examined : Tamenglong district : 1♂, Tamenglong, Killed by local tribals.

Measurements : None.

Diagnosis : Size large, hind foot over 80 mm; shoulder patch very indistinct; the head including forehead, white, strongly contrasted with the back; ears white.

Distribution : India : Manipur : Bishenpur district (Ellerman 1961), Tamenglong district, Chandel district; Assam; Meghalaya; Nagaland.

Elsewhere : Myanmar.

Remarks : A number of skins of Red-and-white Flying Squirrel were found kept inside the houses of local tribals as decorative at Tamenglong and Chandel after the flesh was consumed as food.

Genus *Hylopetes* Thomas, 1908

Two species and subspecies of the genus *Hylopetes* occur in Manipur.

Key to the species and subspecies of the genus *Hylopetes*

- Larger species; occipitonasal length 42.5 mm or more, hind foot 36 mm or more.....
.....*H. alboniger alboniger*
- Smaller species; occipitonasal length less than 42 mm; hind-foot less than 34 mm.....
.....*H. phayrei phayrei*

47. *Hylopetes phayrei phayrei* (Blyth)

1859. *Sciuropterus phayrei* Blyth, *J. Asiat. Soc. Beng.*, 28 : 278. (Rangoon, Myanmar).

Common name : Phayre's Flying Squirrel (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : As given above in key.

Distribution : India : Manipur : Chandel district (Ellerman 1961, Agrawal and Chakraborty 1979).

Elsewhere : Thailand, Myanmar.

Remarks : Not a single specimen was seen during recent survey trips. Though 'Manipur' has

been shown in the range of distribution of this species by earlier workers, its occurrence in Manipur at present is doubtful.

48. *Hylopetes alboniger alboniger* (Hodgson)

1836. *Sciuropterus alboniger* Hodgson, *J. Asiat. Soc. Beng.*, 5 : 231 (Nepal).

Common name : Parti-coloured Flying Squirrel (Eng.).

Material examined : Senapati district : 1 Juv. ♂, Modbung (c 1219 m), c 26 km N of Imphal of Dimapur Road, coll. M. L. Roonwal, 10.xii.1945. Ukhrul district : 1 Adult ?, Ukhrul (c 900 m), coll. T. Bhagirath.

Measurements : External : 1 Juv ♂ : HB 196; TI 178; Hf 45; E 32. 1 Adult ? : HB 240.0; TI 390.0; Hf 140.0; E 25.0. Cranial : 1 Adult ? : On 49.6; n 14.0; p 24.5; mtr 10.8; b 9.2; iw 10.3.

Diagnosis : Dorsal colour greyish to reddish brown; white or light patches present in the region of shoulder; undersurface greyish; throat and chest tends to be whitish. Occipitonasal length mostly over 45 mm.

Distribution : India : Manipur : Senapati district (Roonwal 1950), Ukhrul district; Arunachal Pradesh (Saha 1985); Meghalaya; Nagaland; West Bengal.

Elsewhere : Nepal, Bangladesh, Myanmar and China.

Genus *Callosciurus* Gray, 1867

Two species and subspecies of the genus *Callosciurus* occur in Manipur.

Key to the species of the genus *Callosciurus*

- Frontal width usually approximates to one-third of the occipitonasal length or less.....
.....*C. pygerythrus blythi*
- Frontal width clearly more than one-third of the occipitonasal length.....
.....*C. erythraeus erythrogaster*

49. *Callosciurus erythraeus erythrogaster* (Blyth)

1842. *Sciurus erythrogaster* Blyth, *J. Asiat. Soc. Beng.*, 11 : 970 (Manipur).

Common name : Pallas's Squirrel (Eng.).

Material examined : Imphal district : 1♀, Kanglatongbi, c 1068 m, 17 km N of Imphal on Dimapur Road, coll. M.L. Roonwal, 24.ix.1945. Tamenglong district : 1♂, 1♀, Luanglong Khulen (c 991 m), c 100 km W of Imphal on Silchar Road, ZSI Naga Hill & Manipur Survey, 10.ii.1936.

Measurements : External : 1♀ : HB 236.0; TI 204.0; Hf 53.0; E 23.0. 1♂ : HB 207.0; TI 274; Hf 55; E 21. Cranial : 1♂ : *on* 54.9; *n* 16.8; *p* 26; *iw* 18.2; *orb* 18.0; *b* 9.8.

Diagnosis : As given above in key.

Distribution : India : Manipur : Imphal district (Roonwal 1950), Senapati district, Chandel district, Tamenglong district; Assam; Meghalaya; Mizoram; Nagaland.

Elsewhere : Bangladesh and Myanmar.

Remarks : Specimens of Pallas's Squirrel were seen at Noney, Tamenglong, Moreh and Chandel during recent survey trips there.

50. *Callosciurus pygerythrus blythi* (Tytler)

1845. *Sciurus blythii* Tytler, *Ann. Mag. nat. Hist.*, 14 : 172 (Dhaka, Bangladesh).

Common name : Irrawaddy Squirrel (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : As given in Key.

Distribution : India : Manipur : Chandel district, Imphal district, Senapati district; Assam; Meghalaya; Nagaland; Tripura.

Elsewhere : Bangladesh and Myanmar.

Remarks : During recent survey trips specimens of Irrawaddy Squirrel were seen at Chandel, Uchathol and Turibari.

Genus *Tamiops* J. Allen, 1906

One species and subspecies of the genus *Tamiops* occurs in Manipur.

51. *Tamiops macclellandi macclellandi* (Horsfield)

1839. *Sciurus macclellandi* Horsfield, *Proc. zool. Soc. Lond.* : 152 (Assam, India).

Common name : Himalayan Striped Squirrel (Eng.).

Material examined : Temenglong district; 1♂, Luanglong Khuten (c 991 m), c 100 km W of Imphal on Silchar Road, coll. ZSI Naga hill and Manipur Survey, 10.ii.1936.

Measurements : None.

Diagnosis : Dorsal surface of body varies from greyish to brownish and striped, median stripe being black; ventral surface greyish white; ear tufts black, with conspicuous white tip.

Distribution : India : Manipur : Imphal district, Chandel district, Tamenglong district, Ukhrul district; Arunachal Pradesh; Assam; Meghalaya; Mizoram; Nagaland; Sikkim.

Elsewhere : Nepal, Bhutan, and Myanmar.

Remarks : Specimens were seen at Uchathol, Chandel, Tamenglong and Ukhrul during recent survey trips to that area.

Genus *Dremomys* Heude, 1898

One species and subspecies of the genus *Dremomys* occurs in Manipur.

52. *Dremomys lokriah macmillani* Thomas

1916. *Dremomys macmillani* Thomas, *J. Bombay nat. Hist. Soc.*, 24(2) : 238 (Tatkon, western Myanmar).

Common name : Orange-bellied Himalayan Squirrel, Macmillan's Squirrel (Eng.).

Material examined : Imphal district : 8♂, 3♀, 1 unsexed, Kanglatongbi (c 1068 m), c 20 km N of Imphal on Dimapur Road, coll. M.L. Roonwal, 20.x–18.xii.1945. Tamenglong district: 1♂, Luanglong khuten (c 991 m), c 100 km w of Imphal on Silchar Road, coll. ZSI Naga hill & Manipur Survey, 10.ii.1936.

Measurements : External : 5♂ : HB 160-210; TI 110-160; Hf 44-47; E 19-21. 3♀ : HB 180-194; TI 133-153; Hf 42-45; E 19-22.

Diagnosis : More or less like the Irrawaddy Squirrel in appearance, except that a mid-dorsal black stripe occasionally present; belly washed with buff or yellowish; ear patches rufous.

Distribution : India : Manipur : Imphal district, Senapati district, Tamenglong district; Assam; Meghalaya; Nagaland, Tripura.

Elsewhere : Myanmar.

Remarks : Though not common, two specimens of Orange-bellied Himalayan Squirrel were seen at Turibari.

Genus *Ratufa* Gray, 1867

One species and subspecies of the genus *Ratufa* occurs in Manipur.

53. *Ratufa bicolor gigantea* (M'Clelland)

1839. *Sciurus giganteus* M'Clelland, *Proc. zool. Soc. Lond.* : 150 (Assam, India).

Common name : Malayan Giant Squirrel (Eng.).

Material examined : Tamenglong district : 2♀, Nanglea Atrow (c 991 m), c 100 km W of Imphal on Silchar Road, coll. ZSI Naga hill and Manipur Survey, 10,11.ii.1936.

Measurements : None.

Diagnosis : A large-sized diurnal squirrel; dorsal colour varies from brown to black; venter buff.

Distribution : India : Manipur : Tamenglong district; Arunachal Pradesh; Assam; Meghalaya; Nagaland; Sikkim; Tripura; West Bengal.

Elsewhere : Bhutan, Myanmar and China.

Remarks : Not a single specimen of Malayan Giant Squirrel was seen during recent survey trips there.

Family HYSTRICIDAE

Fur more or less modified into long spines or quills; angular portion of mandible arises from the bony socket of lower incisor.

Two genera, namely, *Hystrix* and *Atherurus* occur in India, of which only the former genus is known to occur in Manipur.

* Wilson and Reeder (1992) treated this Family Rhizomyidae as Subfamily Rhizomyinae under Family Muridae.

Genus *Hystrix* Linnaeus, 1758

One species of the genus *Hystrix* occurs in Manipur.

54. *Hystrix brachyura* Linnaeus

1758. *Hystrix brachyura* Linnaeus, *Syst. Nat.*, 10th ed., 1 : 57 (Malaysia, Malacca).

Common name : Crestless Himalayan Porcupine, Chinese Porcupine (Eng.).

Material examined : Senapati district : 1 subad ♀, 30 km N of Imphal on Dimapur Road (c 1067 m), coll. M.L. Roonwal, 29.xi.1945.

Measurements : External : 1 subad ♀ : HB 555; TI 120; Hf 85; E 37. Cranial : 1 subad ♀ : on 119.0; cb 117.0; n 66.2; pl 55.0; d 32.0; b 17.2; ml 75.5.

Diagnosis : No crest of bristles present on the crown; quills bear only dark band in the middle, rest white; tail less than one fifth of head and body length; caudal rattling quills of tail more open and more developed.

Distribution : India : Manipur : Senapati district (Roonwal 1950); Nagaland.

Elsewhere : Myanmar, Thailand, southern China, Malaya, Sumatra, Borneo and erstwhile Indo-China.

Family RHIZOMYIDAE*

The family is represented by two genera in India and both of them occur in Manipur. Both the genera, *Rhizomys* and *Cannomys* are adapted to subterranean mode of life. They have large proodont incisors, small eyes and ears, short limbs armed with strong claws.

Key to the genera of the family RHIZOMYIDAE

- Size large, condylobasal length of skull not less than 57.0 mm; sole of feet granulated; mammae 10; M.1 is larger than M.2 *Rhizomys*
- Size small, condylobasal length of skull less than 55.0; sole of feet not granulated; mammae 8; M.1 is often smaller than M.2 *Cannomys*

Genus *Rhizomys* Gray, 1831

One species and subspecies of the genus *Rhizomys* occurs in Manipur.

55. *Rhizomys pruinosus pruinosus* Blyth

1851. *Rhizomys pruinosus* Blyth, *J. Asiat. Soc. Beng.*, 20 : 519 (Cherrapunji, Meghalaya, India).

Common name : Hoary Bamboo Rat (Eng.).

Material examined : Tamenglong district : 1♀, Luanglong Khulen (c 991 m), c 100 km W of Imphal on Silchar Road, coll. ZSI Naga hill & Manipur Survey, 9.ii.1936.

Measurements : None.

Diagnosis : Much larger than any other rodent, head and body length 20 to 30 cm or more; colour dark brown, grizzled; tail about 10 cm or so; palatal length 32.2 mm.

Distribution : India : Manipur : Tamenglong district, Bishenpur district (Ellerman 1961); Assam; Meghalaya; Nagaland.

Elsewhere : Myanmar, Thailand, erstwhile Indo-China and China.

Genus *Cannomys* Thomas, 1915

One species and subspecies of the genus *Cannomys* occurs in Manipur.

56. *Cannomys badius badius* (Hodgson)

1841. *Rhizomys badius* Hodgson, *Calcutta J. nat. Hist.*, 2 : 410 (Nepal).

Common name : Bay Bamboo Rat (Eng.).

Material examined : Tamenglong district : 1♂, 2♀, Luanglong Khulen (c 991 m), c 100 km W of Imphal on Silchar Road, coll. ZSI Naga Hill & Manipur Survey, 9.ii.1936.

Measurements : None.

Diagnosis : Smaller than *Rhizomys*; head and body 19 to 20 cm; colour chestnut bay or ashy brown, not grizzled; tail about 7 cm or so.

Distribution : India : Manipur : Tamenglong district, Bishenpur district (Ellerman 1961); Arunachal Pradesh; Assam; Meghalaya; Mizoram; Nagaland.

Elsewhere : Nepal, Bhutan, Bangladesh, Myanmar, China, Thailand and Combodia.

Family MURIDAE

In Manipur, the family Muridae is represented by eight genera.

Key to the genera of the family MURIDAE

1. Postero-internal cusp of upper molars present *Chiropodomys*
— Postero-internal cusp of upper molars absent 2
2. Hallux opposable; hallux and fifth toe having a flat nail *Vandeleuria*
— Hallux not opposable; hallux and fifth toe provided with a claw 3
3. Condylbasal length exceeds or equal to occipitonasal length; anterior palatal foramina more than 7 mm in length *Bandicota*
— Condylbasal length less than occipitonasal length; anterior palatal foramina less than 7 mm 4
4. First upper molar more than half the length of cheektooth row, and its antero-internal cusp distorted inwards to reach the level of second lamina; third molar extremely reduced *Mus*
— First upper molar less than half the length of cheektooth row, and its antero-internal cusp not distorted inwards to reach the second lamina; third molar not so reduced 5
5. Occipitonasal length more than 33.2 mm ... 6
— Occipitonasal length less than 33.2 mm 7
6. Palate short, less than one-half of occipitonasal length; anterior palatal foramina less than one-fifth of occipitonasal length *Niviventer*
— Palate long, more than one-half of occipitonasal length; bulla more than 15% of occipitonasal length *Rattus*
7. Bullae large, about 19% of the occipitonasal length *Diomys*
— Bullae rather small, not reaching 19% of the occipitonasal length *Hadromys*

Genus *Chiropodomys* Peters, 1868

One species and subspecies of the genus *Chiropodomys* occurs in Manipur.

57. *Chiropodomys gliroides gliroides* (Blyth)

1856. *Mus gliroides* Blyth, *J. Asiat. Soc. Beng.*, **24** : 721 (Cherrapunji, Khasi Hills, Meghalaya, India).

Common name : Pencil-tailed Tree Mouse (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Relatively small climbing mice, head and body length under 100 mm; tail long, over 130% of head and body length, wholly dark, tufted terminally; fur soft, brown above, white or dirty white below; feet usually light.

Distribution : India : Manipur (Anderson 1881); Assam; Meghalaya.

Elsewhere : Myanmar, Malaysia, southern China, Vietnam and Thailand.

Remarks : Anderson (1881) recorded this species from Manipur without mentioning any exact locality.

Genus *Vandeleuria* Gray, 1842

One species and subspecies of the genus *Vandeleuria* occurs in Manipur.

58. *Vandeleuria oleracea dumeticola* (Hodgson)

1845. *Mus dumeticola* Hodgson, *Ann. Mag. nat. Hist.*, **15** : 268 (Nepal).

Common name : Indian Long-tailed Tree Mouse (Eng.).

Material examined : Tamenglong district; 1♂, Tamenglong (c 1280 m), coll. Ajoy Kumar Mandal, 24.xi.1992.

Measurements : External : 1♂ : HB 570; TI 99.0; Hf 16.0; E 13.5 Cranial : None.

Diagnosis : Occipitonasal length less than 23.0 mm; tail more than 150% of head and body length; colour bright red on back.

Distribution : India : Manipur : Tamenglong

district, Bishenpur district (Ellerman 1961); Arunachal Pradesh; Assam; Bihar; Meghalaya; Nagaland; Orissa; Sikkim; Uttar Pradesh; West Bengal.

Elsewhere : Nepal and Myanmar.

Genus *Hadromys* Thomas, 1911

The genus *Hadromys* is monotypic.

59. *Hadromys humei* (Thomas)

1886. *Mus humei* Thomas, *Proc. Zool. Soc. Lond.*, : 63 (Moirang, Manipur).

Common name : Hume's Rat (Eng.).

Material examined : Senapati district : 2♂, off milestone 117, on Imphal-Dimapur Road, coll. M.L. Roonwal, 25.vii.1945, 18.xii.1945. Bishenpur district : 4♂, off milestone 34, on Imphal-Tamu Road, coll. M.L. Roonwal, 17.xi.1945-14.xi.1945.

Measurements : External : 6♂ : HB 92.0-140.0 (123.5); TI 121.0-135.0 (128.4); Hf 24.0-27.0 (25.5); E 15-19 (17.3). Cranial : 6♂ : *on* 30.8-32.3 (31.8); *pl* 13.2-13.6 (13.5); *b* 4.5-5.1 (4.9).

Diagnosis : Dorsal colour dark salt-and-pepper coloured, with rusty tinge on the rump; ventral colour dirty white, tinged with buff; hands and feet buff-coloured; foot with five toes, the fifth toe and the hallux, both clawed; tail horay black above, pale pinkish below.

Distribution : India : Manipur : Senapati district, Bishenpur district (Roonwal 1950); Assam.

Elsewhere : Southern China.

Genus *Rattus* Fischer, 1803

Four species of the genus *Rattus* occur in Manipur.

Key to the species of the Genus *Rattus*

1. Tail unicolour 2
- Tail bicolour 3
2. Nasal long, usually exceeding 38% of occipitonasal length *R. nitidus*
- Nasal short, usually less than 38% of occipitonasal length *R. rattus*

3. Diastema more than 31% of occipitonasal length *R. manipulus*

— Diastema less than 31% of occipitonasal length *R. mackenziei*

***Rattus rattus* (Linnaeus, 1758)**

Rattus rattus is represented in Manipur by three subspecies. Commonly found in houses, fields, forests and other habitats.

Key to the subspecies of *Rattus rattus*

1. Underparts of body white or dirty white 2

— Underparts of body dull or dark coloured
..... *Rattus rattus tistae*

2. Size large; head and body length over 160 mm; tail short, being 100% of head and body length *Rattus rattus bullocki*

— Size smaller; head and body length below 160 mm; tail longer, being 123-131% of head and body length *Rattus rattus brunneusculus*

60. *Rattus rattus brunneusculus* (Hodgson)

1845. *Mus brunneusculus* Hodgson, *Ann. Mag. nat. Hist.*, 15 : 276 (Nepal).

Common name : House Rat (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Size smaller; head and body length below 160 mm; tail larger, being 123-131% of head and body length.

Distribution : India : Manipur : Bishenpur district (Ellerman 1961); Arunachal Pradesh; Assam; Jammu & Kashmir; Meghalaya; Nagaland; Sikkim; West Bengal.

Elsewhere : Nepal and Bhutan.

61. *Rattus rattus bullocki* Roonwal

1948. *Rattus rattus bullocki* Roonwal, *Proc. nation. Inst. Sci. India*, 14 : 385 [c 16 miles north of Imphal on Dimapur Road (c 1070 m), Manipur].

Common name : The Common Manipur White-bellied Rat (Eng.).

Material examined : Senapati district : 1♀

(Holotype), c 26 km N of Imphal on Dimapur Road (c 1070), coll. M. L. Roonwal, 4.viii.1945.

Measurements : External : 1♀ : HB 166; TI 167; Hf 33; E 21. Cranial : 1♀ : *on* 41.3; *cb* 38.1; *zw* 21.0; *iw* 6.1; *cw* 16.5; *b* 7.4; *n* 15.6; *d* 12.7; *apf* 7.5; *mtr* 6.8; *ml* 23.1.

Diagnosis : Dorsal colour of body dark grey to ochraceous tawny, ground colour more grey than tawny; ventral colour pure to ivory white, with hoary buff or pale yellow streaks or patches.

Distribution : India : Manipur : Senapati district, Chandel district (Roonwal 1950).

62. *Rattus rattus tistae* Hinton

1918. *Rattus rattus tistae* Hinton, *J. Bombay nat. Hist. Soc.*, 26 : 68 (Pashok, Darjiling district, West Bengal, India).

Common name : House Rat (Eng.).

Material examined : Chandel district : 1♂, Chandel, 65 km E of Imphal, coll. A.K. Poddar, 8.iii.1992. Churachandpur district : 1♂, 1♀, Churachandpur, coll. A.K. Poddar, 12, 14.iii.1992. Senapati district : 1♂, Turibari (c 1250 m), 5 km W of Kangpokpi, coll. Ajoy Kumar Mandal, 9.xi.1992. Ukhrul district : 3 Subad ♂, Ukhrul (c 1800 m), coll. Ajoy Kumar Mandal, 17.xi.1992. Tamenglong district : 3♂, 1 Subad ♀, Tamenglong (c 1280 m), coll. Ajoy Kumar Mandal, 20-24.xi.1992.

Measurements : External : 2♂ : HB 155.0, 198.0; TI 135.0, 180.0; Hf 32.0, 37.0; E 20.0, 23.0. 1♀ : HB 170.0, TI 140.0; Hf 33.0; E 20.0. Cranial : 2♂ : *on* 38.8, 46.1; *n* 14.7, 18.2; *pl* 19.8, 25.0; *apf* 7.0, 8.6; *mtr* 6.7, 6.9; *b* 6.1, 6.9; *d* 10.4, 12.8. 1♀ : *on* 41.7; *n* 16.3; *pl* 22.9, *apf* 7.6; *mtr* 6.7; *b* 6.3, *d* 11.5.

Diagnosis : Underparts of body dull or dark coloured; occipitonasal length normally not reaching 42 mm; toothrow mostly over 6.6 mm.

Distribution : India : Manipur : Bishenpur district (Roonwal 1950), Chandel district, Churachandpur district, Senapati district, Ukhrul district, Tamenglong district; Arunachal Pradesh; Assam; Meghalaya; Nagaland; Sikkim; West Bengal.

Elsewhere : Bhutan (Chakraborty 1975).

63. *Rattus nitidus obsoletus* Hinton

1919. *Rattus nitidus obsoletus* Hinton, *J. Bombay nat. Hist. Soc.*, 26 : 415 (50 miles W of Kindat, alt. 1524 m, Chin Hills, Myanmar).

Common name : Himalayan Rat (Eng.).

Material examined : Tamenglong district : 1♂, Regailous Camp (c 991 m), c 101 km W of Imphal on Silchar Road, coll. ZSI Naga Hill & Manipur Survey, 11.ii.1936. Senapati district : 1♂, 26 km N of Imphal on Dimapur Road (c 1067 m), coll. M.L. Roonwal, 8.xii.1945.

Measurements : External : 2♂ : HB 155, 150; TI 140, 138; Hf 34, 35, E 25, 25. Cranial : 1♂ : on 37.2; cb 35.0; iw 5.5; b 6.2; n 15.0; p 17.6; d 9.6; apf 6.2, mtr 6.6; ml 20.7.

Diagnosis : Harsher-furred rat; tail subequal to head and body length.

Distribution : India : Manipur : Senapati district (Roonwal 1950), Tamenglong district (Roonwal 1950).

Elsewhere : Myanmar.

64. *Rattus mackenziei* (Thomas)

1916. *Epimys mackenziei* Thomas, *J. Bombay nat. Hist. Soc.*, 24 : 410 (Haingyan, 50 miles W of Kindat, Chin Hills, Myanmar).

Common name : Mackenzie's Rat (Eng.).

Material examined : Tamenglong district : 2♂, Luanglong Khulen (c 991 m), c 101 km W of Imphal on Silchar Road, ZSI Naga hill & Manipur survey, 9.ii.1936.

Measurements : External : 2♂; HB 205, 205; TI 245, 237; Hf 48, 50. Cranial : 2♂ : on 50.2, 48.8; iw(1) 7.5; n 20.5, 19.7; b 6.6, 6.5; pl 23.8, 23.1; d 15.6, 14.6; apf 9.4, 9.2; mtr 7.9, 8.4.

Diagnosis : A giant size rat, hind foot about 50 mm in length; opisthodont incisors; small bullae; 3+2 mammae.

Distribution : India : Manipur : Bishenpur district (Ellerman 1961), Tamenglong district; Assam; Meghalaya; Nagaland.

Elsewhere : Myanmar.

65. *Rattus manipulus manipulas* (Thomas)

1916. *Epimys manipulus* Thomas, *J. Bombay nat. Hist.*

Soc., 24(3) : 413 (c 20 miles W of Kindat, Kabaw valley, Myanmar).

Common name : The Manipur Rat (Eng.).

Material examined : Imphal district : 6♂, 2♀, on Dimapur Road, Imphal, coll. M.L. Roonwal, 25.vi.1945-3.xi.1945.

Measurements : Nil.

Diagnosis : Medium sized, head and body less than 200 mm; dorsal colour grizzly grey, darker mid-dorsally; ventral colour pure white, sharply demarcated from dorsum; tail dark above, pale yellow basally, pale at end; occipitonasal length 36-41 mm; length of bulla less than 6.0 mm; diastema lengthened, over 31% of occipitonasal length.

Distribution : India : Manipur : Imphal district, Senapati district, Bishenpur district (Ellerman 1961); Meghalaya (Blanford 1891).

Elsewhere : Myanmar and Thailand.

Genus *Niviventer* Marshall, 1976

One species, namely *Niviventer niviventer*, occurs in Manipur. Tail in this genus is generally bi-coloured; underside normally white or dirty white. It is represented by two subspecies.

Key to the subspecies of *N. niviventer*

- Smaller race, occipitonasal length less than 34.0 mm *N. niviventer niviventer*
- Larger race, occipitonasal length more than 35.0 mm *N. niviventer mentosus*

66. *Niviventer niviventer niviventer* (Hodgson)

1836. *Mus. niviventer* Hodgson, *J. Asiat. Soc. Beng.*, 5 : 234 (Kathmandu, Nepal).

Common name : White-bellied Rat (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Smaller race; occipitonasal length below 34.0 mm; bullae more than 13% of occipitonasal length; underparts white, lacking midventral stripe.

Distribution : India : Manipur : Chandel district (Roonwal 1950); Himachal Pradesh; Uttar Pradesh; West Bengal.

Elsewhere : Bhutan (Chakraborty 1975) and Myanmar.

67. *Niviventer niviventer mentosus* (Thomas)

1916. *Rattus mentosus* Thomas, *J. Bombay nat. Hist. Soc.*, **24** : 643 (H'kamti, c 152 m, Upper Chindwin, Myanmar).

Common name : White-bellied Rat (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Larger Race; occipitonasal length varying between 35.3 and 42.5 mm; bullae most often below 13% of occipitonasal length.

Distribution : India : Manipur : Imphal district (Roonwal 1950); Arunachal Pradesh; Assam; Meghalaya.

Elsewhere : Myanmar.

Genus *Mus* Linnaeus, 1775

Three species of the genus *Mus* occur in Manipur.

Key to the species of the genus *Mus*

1. Tail unicoloured and longer than head and body *M. musculus*
— Tail bicoloured (pale below) and equal to or shorter than head and body 2
2. Ventral colour silvery grey *M. cervicolor*
— Ventral colour dark brown *M. famulus*

Mus musculus Linnaeus

Three subspecies of *Mus musculus* occur in Manipur. All of them are known to do considerable damage to house-hold articles.

Key to subspecies of *Mus musculus*

1. Undersurface of body light grey
..... *M.m. homourus*
— Undersurface of body light or dark brown .2
2. Dorsal surface of body dark brown
..... *M.m. castaneus*

— Dorsal surface of body light brown
..... *M.m. urbanus*

68. *Mus musculus castaneus* Waterhouse

1843. *Mus castaneus* Waterhouse, *Ann. Mag. nat. Hist.*, **12** : 134 (Philippines).

Common name : House Mouse (Eng.).

Material examined : Senapati district : 2♂, Turibari (c 1250 m), 5 km W of Kangpokpi, coll. Ajoy Kumar Mandal, 10.xi.1992.

Measurements : External : 2♂ : HB 75.0; 79.0; TI 85.0; 90.0; Hf 12.0; 16.0; E 11.8; 12.5. Cranial : 2♂ : *on* 20.1, 21.3; *n* 7.4, 8.7; *pl* 9.8, 10.7; *mtr* 3.2, 3.4; *b* 3.5, 3.4; *apf* 4.5, 5.1; *d* 5.0, 5.3.

Distribution : India : Manipur : Senapati district; Andhra Pradesh; Assam; Bihar; Delhi; Gujarat; Jammu & Kashmir; Karnataka; Kerala; Meghalaya; Orissa.

Elsewhere : Africa, Sri Lanka, Myanmar, China, Thailand, Malaysia, Philippines and New Guinea.

Remarks : The present record includes Manipur in the range of distribution of this Mouse. It was found common near houses.

69. *Mus musculus homourus* Hodgson

1845. *Mus homourus* Hodgson, *Ann. Mag. nat. Hist.*, **15** : 268 (Nepal).

Common name : Southern Himalayan House Mouse (Eng.).

Material examined : Senapati district : 1♂, 26 km N of Imphal on Dimapur Road (c 1067 m), coll. M.L. Roonwal, 21.ix.1945.

Measurements : External : 1♂ : HB 80.0; TI 71.0; Hf 14.0; E 11.0. Cranial : 1♂ : *on* 20.4; *cb* 19.8; *zw* 10.7; *n* 7.6; *mtr* 3.5; *cw* 9.6; *apf* 4.9.

Distribution : India : Manipur : Senapati district (Roonwal 1950); Assam; Himachal Pradesh; Jammu & Kashmir; Meghalaya; Nagaland; Sikkim; Tamil Nadu; Uttar Pradesh; West Bengal.

Elsewhere : Nepal, Myanmar, China, Formosa, Vietnam and Java.

70. *Mus musculus urbanus* Hodgson

1845. *Mus urbanus* Hodgson, *Ann. Mag. nat. Hist.*, **15** : 269 (Kathmandu, Nepal).

Common name : House Mouse (Eng.).

Material examined : Churachandpur district : 1♂, 2♀ : Churachandpur, coll. A.K. Poddar, 11-13.iii.1992. Imphal district : 4♀ : Uchathol (c 175 m), 5 km E of Jiribam, coll. A.K. Poddar, Ajoy Kumar Mandal, 19-20.iii.1992, 29.xi.1992. Senapati district : 1♀ : Turibari (c 1250 m), 5 km W of Kangpokpi, coll. Ajoy Kumar Mandal, 9.xi.1992.

Measurements : External : 1♂ : HB 80.0; TI 98.0; Hf 16.0; E 14.0. 2♀ : HB 72.0, 71.4; TI 85.0, 83.0; Hf 16.4, 16.0; E 13.0, 12.2. Cranial 1♂ : *on* 22.2; *n* 9.2; *pl* 11.3; *apf* 4.9; *d* 5.7; *b* 3.4; *mtr* 3.3. 2♀ : *on* 19.7, 20.8; *n* 7.1, 8.0; *pl* 9.8, 10.4; *apf* 4.6, 4.7; *d* 4.7, 5.1; *b* 3.3, 3.3; *mtr* 3.2, 3.2.

Distribution : India : Manipur : Churachandpur district, Imphal district, Senapati district; Andaman Islands; Assam; Maharashtra; Rajasthan; Sikkim; Tamil Nadu; Uttar Pradesh; West Bengal.

Elsewhere : Nepal and Sri Lanka.

Remarks : Colour of under surface varies from grey to brown, and tail from wholly dark to bicolour. This constitutes the first record of this subspecies from Manipur.

71. *Mus cervicolor imphalensis* Roonwal

1948 *Leggada nagarum imphalensis* Roonwal, *Proc. nation. Inst. Sci. India*, **14** : 386 (16 miles N of Imphal on Dimapur Road, c 1070 m, Manipur, India).

Common name : The Manipur Jungle Mouse (Eng.).

Material examined : Senapati district : 1♀ (Holotype), 26 km N of Imphal on Dimapur Road (c 1070 m), coll. M.L. Roonwal, 26.vii. 1945.

Measurements : External : 1♀; HB 86.0; TI 59.0; Hf 15.0; E 13.0. Cranial : 1♀ : *on* 21.4; *cb* 19.7; *zw* 10.0; *iw* 3.7; *cw* 9.6; *b* 3.8; *n* 8.4; *d* 6.2; *apf* 5.0; *mtr* 3.6.

Diagnosis : Dorsal colour grizzled dark mummy brown, paler and more tawny at sides;

ventral colour silvery grey; tail hairs dark brown, with pale rufous tips; tail much shorter than head and body; nasals much longer (above 39% of occipitonasal length); zygomatic plate straight.

Distribution : India : Manipur : Senapati district (Roonwal 1950). Myanmar.

72. *Mus famulus cooki* Ryley

1914. *Mus cooki* Ryley, *J. Bombay nat. Hist. Soc.*, **22** : 664. (Gokteick, Shan States, Myanmar).

Common name : Cooki Mouse (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : 70-90 mm in head and body length; tail bicolour, more than 90% of head and body length; body colour light brown above, a little darker below.

Distribution : India : Manipur : Chandel district (Ellerman 1961); Nagaland.

Elsewhere : Myanmar.

Genus *Diomys* Thomas, 1917

The genus *Diomys* is monotypic and occurs in Manipur.

73. *Diomys crumpi* Thomas

1917. *Diomys crumpi* Thomas, *J. Bombay nat. Hist. Soc.*, **25**(2) : 204 (Paresnath, Hazaribagh, Bihar, India).

Common name : Crump's Mouse (Eng.).

Material examined : Nil.

Measurements : None.

Diagnosis : Dorsal colour blackish grey, mid-dorsal area darker than head and shoulder; ventral colour whitish grey, hairs dark basally, white terminally; tail sharply bicoloured, black above, white below.

Distribution : India : Manipur : Bishenpur district (Ellerman 1961); Bihar.

Genus *Bandicota* Gray, 1873

Two species of the genus *Bandicota* occur in Manipur.

Key to the species of the genus *Bandicota*

- Size large, head and body length more than 220 mm; anterior palatal foramina equally broad at both ends; nasals more than one third of occipitonasal length.....*B. indica*
- Size small, head and body length less than 220 mm; anterior palatal foramina narrower posteriorly; nasals short, less than one-third of occipitonasal length*B. bengalensis*

74. *Bandicota bengalensis bengalensis* (Gray)

1835. *Arvicola bengalensis* Gray, *Illustr. Ind. Zool.*, 2 : pl. 21 (Bengal).

Common name : Lesser Bandicoot Rat (Eng.).

Material examined : Nil.

Measurements : None.

Distribution : India : Manipur : Imphal district (Subiah & Singh 1984), Senapati district (Roonwal 1950), Chandel district (Roonwal 1950); Churachandpur district; throughout India.

Elsewhere : Pakistan, Sri Lanka, Nepal, Bhutan, Bangladesh and Myanmar.

Remarks : Most predominant rodent species. Found in the fields as well as godowns, causing considerable damage to grains. Breeds throughout the year.

Though no specimen of this species could be collected from Imphal and Churachandpur districts, its burrows were observed in both these districts.

75. *Bandicota indica nemorivaga* (Hodgson)

1836. *Mus (Rattus) nemorivagus* Hodgson, *J. Asiat. Soc. Beng.*, 5 : 234 (Nepal).

Common name : Large Bandicoot Rat (Eng.).

Material examined : Nil.

Measurements : None.

Distribution : India : Manipur : Imphal district; Assam; Bihar; Meghalaya; Sikkim; West Bengal.

Elsewhere : Nepal, Bangladesh, Thailand and Formosa.

Remarks : A single specimen of this rat was trapped at Jiribam, but escaped while handling.

SUMMARY

An account of the mammalian fauna of Manipur, based mainly on the old and recent collections present in the Zoological Survey of India as well as those recorded in the literature, has been provided. Altogether 75 species and subspecies (69 species) belonging to 55 genera, 22 families and 8 orders have been reported.

Keys and diagnostic characters for identification of all the species have been given.

Detailed district-wise distribution in Manipur, along with distributional range in India and outside for each described form have also been included.

Crocidura attenuata rubricosa, *Anourosorex squamipes squamipes*, *Megaerops niphanae*, *Hipposideros lankadiva*, *Hipposideros armiger armiger*, *Scotozous dormeri* have been reported for the first time from Manipur.

Taxonomic comments on the above mentioned species have been given.

Relative abundance of a number of large and small mammals has also been given.

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REFERENCES

- AELLEN, V. 1959. Contribution a' l'etude de la faune d' Afghanistan 9. Chiropteres. *Revue suisse Zool.*, **66** : 353-386.
- AGRAWAL, V. C. 1980. Murids of North-Eastern India. In : A. K. Ghosh (ed.). *Studies on rodents and their control*. Shillong (Meghalaya Science Society), : 1-22.
- AGRAWAL, V. C. and BHATTACHARYA, T. P. 1977. Report on a collection of mammals from Tripura. *Rec. zool. Surv. India*, **73** : 135-157.
- AGRAWAL, V. C. and CHAKRABORTY, S. 1971. Notes on a collection of small mammals from Nepal, with the description of a new mouse hare [Lagomorpha : Ochotonidae]. *Proc. zool. Soc., Calcutta*, **24** : 41-46.
- AGRAWAL, V. C. and CHAKRABORTY, S. 1979. Catalogue of mammals in the Zoological Survey of India. Rodentia. Part I. Sciuridae, *Rec. zool. Surv. India*, **74** : 333-481.
- AGRAWAL, V. C., DAS, P. K., CHAKRABORTY, S., GHOSE, R. K., MANDAL, A. K., CHAKRABORTY, T. K., PODDAR, A. K., LAL, J. P., BHATTACHARYA, T. P. and GHOSH, M. K. 1992. Mammalia. *State Fauna Series 3 : Fauna of West Bengal*, Part I : 27-169. Calcutta (Zoological Survey of India).
- AHMED, S. K. and HUSAIN, K. Z. 1982. Bats of Bangladesh. *J. Asiat. Soc. Bangladesh (Sci.)*, **8** : 89-99.
- ALFRED, J. R. B. and SATI, J. P. 1986. The gibbon with special reference to *Hylobates hoolock*. In : T. C. Majumuria (ed.). *Wildlife wealth of India. Resources and management*, Bangkok (Tec Press Service). : 384-390.
- ALFRED, J. R. B. and SATI, J. P. 1990. Survey and census of the Hoolock Gibbon in West Garo Hills, northeast India. *Primates*, **31** : 299-306.
- ALLEN, B. C. 1905. Naga Hills and Manipur. In *Assam District Gazetteers*, Vol. IX, Part 2; Manipur, 151 pp. Calcutta.
- ALLEN, G. M. 1908. Notes on Chiroptera. *Bull. Mus. comp. Zool. Harv.*, **52** : 25-26 + 1 pl.
- ALLEN, G. N. 1938. The mammals of China and Mongolia. In : W. Granger (ed.). *Natural History of Central Asia*, 11 (Pt. 1) : 1-XXVIII + 1-620. New York (The American Museum of Natural History).
- ANDERSEN, K. 1912. *Catalogue of the Chiroptera in the collection of the British Museum*. 2nd edn, 1. Megachiroptera. London [British Museum (Natural History)].
- ANDERSON, J. 1881. *Catalogue of Mammalia in the Indian Museum, Calcutta*. Part I. Calcutta (Indian Museum).
- BHAT, H. R. 1968a. Dobson's Long-tongued Fruit Bat, *Eonycteris spelaea* (Dobson) from Kumaon Hills, U. P. : an addition to the Chiropteran fauna of India. *J. Bombay nat. Hist. Soc.*, **64** : 550-551.
- BHAT, H. R. 1968b. *Sphaerias blanfordi* (THomas, 1891) from Himalayan region of Uttar Pradesh : an addition to the Chiropteran fauna of India. *J. Bombay nat. Hist. Soc.*, **65** : 471-473.
- BHATTACHARYA, T. P. 1975. Occurrence of Dobson's Long-tongued Fruit Bat, *Eonycteris spelaea* (Dobson) [Mammalia : Chiroptera : Pteropodidae] in the Andaman Islands, India. *Sci. Cult.*, **41** : 317-318.

- BHATTACHARYYA, T. P. 1977. Occurrence of Indian Pippistrelle, *Pipistrellus coromandra* (Gray) [Mammalia : Chiroptera : Vespertilionidae] in Car Nicobar, Andaman and Nicobar Islands. *J. Bombay nat. Hist. Soc.*, **73** : 516.
- BISWAS, S. 1970. White-browed Gibbon (*Hylobates hoolock* Harlan) and Capped Langur *Presbytis pileatus* Blyth) as human food. *J. Beng. nat. Hist. Soc.*, **36**(1) : 78-80.
- BLANFORD, W. T. 1888-91. *The fauna of British India. including Ceylon and Burma. Mammalia*. London (Taylor and Francis).
- BLYTH, E. 1852. Notice of a collection of Mammalia, Birds and Reptiles, procured at or near the station of Cherrapunji in the Khasia Hills, north of Sylhet. *J. Asiat. Soc. Beng.*, **20** : 517-524.
- BLYTH, E. 1863. *Catalogue of the Mammalia in the Museum Asiatic Society*. Calcutta (Asiatic Society of Bengal).
- BROSSET, A. 1962. The bats of central and western India. Part 2. *J. Bombay nat. Hist. Soc.*, **59** : 583-624.
- CAI, G. and ZHANG, N. 1981. On mammalian fauna in Medong region, Xizang. In : Liu, D. (ed. in Chief). *Proceedings of Symposium on Quinghai-Xizang (Tibet) Plateau* (Beijing, China). **2**. Environment and ecology of Quinghai-Xizang plateau. pp. 1021-1026 + 3 tabs.
- CHAKRABORTY, S. 1975. On a collection of mammals from Bhutan. *Rec. zool. Surv. India*, **68** : 1-20.
- CHAKRABORTY, S. 1983. Contribution to the knowledge of the mammalian fauna of Jammu and Kashmir, India. *Rec. zool. Surv. India, Occ. Pap.* No. **38** : i-iii + 1-129.
- CHASEN, F. N. 1940. A handlist of Malaysian mammals. *Bull. Raffles Mus.*, No. **15** : i-xx + 1-209, map.
- CHATURVEDI, Y. 1969. Two new records of bats from Assam and Andaman Islands. *Labdev J. Sci. Technol. India*, Kanpur, **7B** : 74-75.
- CORBET, G. B. 1980. *The mammals of the Palaearctic region : a taxonomic review* (reprinted with amendments). London and Ithaca [British Museum (Natural History) and Cornell University Press].
- CORBET, G. B. & HILL, J. E. 1992. *The mammals of the Indomalayan region : A systematic review*. Natural History Museum Publications (Oxford University Press), Oxford.
- DAS, P. K. 1986. Studies on the taxonomy and geographical distribution of the species of bats obtained by the silent Valley (Kerala, India) Expedition, 1980. *Rec. zool. Surv. India*, **84** : 259-276.
- DAS, P. K. & AGRAWAL, V. C. 1973. New records of mammals from Orissa. *Sci. Cult.*, **39** : 429-430.
- DAS, P. K., LAL, J. P. and AGRAWAL, V. C. 1993. Mammalia. In : *State Fauna Series 1 : Fauna of Orissa*. Part **4** : 143-180. Calcutta (Zoological Survey of India).
- DEB, D. B. 1960. Forest type studies in Manipur. *Indian Forester*, **86**(2) : 94-111.
- DOBSON, G. E. 1872. Brief descriptions of five new species of Rhinolophine bats. *J. Asiat. Soc. Beng.*, **41**(Pt. 2) : 336-338.
- DOBSON, G. E. 1874. List of Chiroptera inhabiting the Khasia Hills, with description of a new species. *J. Asiat. Soc. Beng.*, **43** (Pt. 2) : 234-236.
- DOBSON, G. E. 1876. *Monograph of the Asiatic Chiroptera, and Catalogue of the species of bats in the collection of the Indian Museum, Calcutta*. London (Indian Museum, Calcutta).

- DOBSON, G. E. 1878. *Catalogue of the Chiroptera in the collection of the British Museum*. London (British Museum).
- ELLERMAN, J. R. 1961. *The Fauna of India, including Pakistan, Burma and Ceylon, Mammalia, 3 Rodentia*. Part I & II. (Govt. of India).
- ELLERMAN, J. R. & MORRISON-SCOTT, T. C. S. 1951. *Check list of Palaearctic and Indian Mammals 1758 – 1946*. 1st edn. London. British Museum (Nat. Hist.).
- ELLERMAN, J. R. MORRISON-SCOTT, T. C. S. 1966. *Check list of Palaearctic and Indian Mammals 1758-1946*. 2nd edn. London. British Museum (Nat. Hist.).
- FOODEN, J. 1982. Taxonomy and evolution of the *Sinica* group of Macaques : 3 species and subspecies accounts of *Macaca assamensis*. *Fieldiana Zool.* (N. S.), No. **10** : 1-52.
- FRY, T. B. 1923. A collection of mammals made by H. Stevens in the Darjeeling district. *J. Bombay nat. Hist. Soc.*, **29** : 90-92.
- FRY, T. B. 1925. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 37(a), Nepal. *J. Bombay nat. Hist. Soc.*, **30** : 525-530.
- GHOSE, R. K. 1965. Notes on some rats (Mammalia : Rodentia) from Mizo district, Assam, India. *J. Beng. nat. Hist. Soc.*, **34** : 35-41.
- GHOSE, R. K. and BHATTACHARYYA, T. P. 1976. Occurrence of Dobson's Long-tongued Fruit Bat, *Eonycteris spelaea* (Dobson) in Assam, India. *J. zool. Soc. India*, **26** : 152-153.
- GHOSH, A. K. and BISWAS, S. 1977. A preliminary report on wildlife of "Balphakram" a proposed sanctuary in Meghalaya, India. *Tiger paper*, **4**(1) : 24-25.
- GHOSH, M. K. 1989. New locality records for *Myotis montivagus peytoni* Wroughton & Ryley, 1913, and *Murina cyclotis cyclotis* Dobson, 1872 (Chiroptera : Vespertilionidae) in the Eastern Ghats of Andhra Pradesh, India. *J. Bombay nat. Hist. Soc.*, **86** : 93-94.
- GRAY, J. E. 1842. Descriptions of some new genera and fifty unrecorded species of Mammalia. *Ann. Mag. nat. Hist.*, **10** : 255-267.
- GRAY, J. E. 1846. New species of Mammalia. *Ann. Mag. nat. Hist.*, (1) **18** (N.S.) : 211-212.
- GRAY, J. E. 1863. *Catalogue of the specimens and drawings of Mammalia and birds of nepal and Thibet presented by B. H. Hodgson Esq. to the British Museum* (2nd ed). London, British Museum (Nat. Hist.).
- HIGGINS, J. C. 1934b. The game birds and animals of the Manipur State, with notes on their numbers, migration and habits. Part V. *J. Bombay nat. Hist.*, **37** : 298-309.
- HILL, J. E. 1962. Notes on some insectivores and bats from upper Burma. *Proc. zool. Soc. Lond.*, **139** : 119-137.
- HILL, J. E. 1963. A revision of the genus *Hipposideros*. *Bull. Br. Mus. nat. Hist. (Zool.)*, **11** : 1-129.
- HILL, J. E. 1964. Notes on some tube-nosed bats, genus *Murina*, from southeastern Asia, with descriptions of a new species and a new subspecies. *Fedn. Mus. J.*, **8** : 48-59 4 pls.
- HILL, J. E. 1967. The bats of Andaman and Nicobar Islands. *J. Bombay nat. Hist. Soc.*, **64** : 1-9.
- HILL, J. E. 1974. New records of bats from southeastern Asia, with taxonomic notes. *Bull. Br. Mus. nat. Hist. (Zool.)*, **27** : 127-138.

- HILL, J. E. 1977. A review of the Rhinopomatidae. *Bull. Br. mus. nat. Hist. (Zool.)*, **32** : 29-43.
- HILL, J. E. 1983. Bats (Mammalia : Chiroptera) from Indo-Australia. *Bull. Br. Mus. nat. Hist. (Zool.)*, **45** : 103-208.
- HILL, J. E. 1987. A note on *Rhinolophus pearsonii* Hersfield, 1851 and *Rhinolophus Yunanensis* Dobson, 1972 (Chiroptera : Rhinolophidae). *J. Bombay nat. Hist. Soc.*, **83** (Suppl.) : 12-18.
- HILL, J. E. AND FRANCIS, C. M. 1984. New bats (Mammalia : Chiroptera) and new records of bats from Borneo and Malaya. *Bull. Br. Mus. nat. Hist. (Zool.)*, **47** : 305-329.
- HILL, J. E. AND HARRISON, D. L. 1987. The baculum in the Vespertilionidae (Chiroptera : Vespertilionidae) with a systematic review, a synopsis of *Pipistrellus* and *Eptesicus*, and the description of a new genus and subgenus. *Bull. Br. Mus. nat. Hist. (Zool.)*, **52** : 225-305.
- HILL, J. E. and THONGLONGYA, K. 1972. Bats from Thailand and Combodia, *Bull. Br. Mus. nat. Hist. (Zool.)*, **22** : 171-196.
- HILL, J. E. and YOSHIYUKI, M. 1980. A new species of *Rhinolophus* (Chiroptera : Rhinolophidae) from Iriomote Island, Ryukyu Islands with notes on the Asiatic members of the *Rhinolophus pusillus* group. *Bull. natn. Sci. Mus., Tokyo, Ser. A (Zool.)*, **6** : 179-189.
- HILL, J. E., ZUBAID, A. and DAVISON, G. W. H. 1986. The taxonomy of leaf-nosed bats of the *Hipposideros bicolor* group (Chiroptera : Hipposideridae) from southeastern Asia. *Mammalia*, **50** : 535-540.
- HINTON, M. A. C. 1918. Scientific results from the Mammal Survey, No. XVIII. Report on the house rats of India, Burma and Ceylon. Part I. *J. Bombay nat. Hist. Soc.*, **26** : 59-86.
- HINTON, M. A. C. 1919. Scientific results from the Mammal Survey, No. XVIII. Report on the house rats of India, Burma and Ceylon. Part II. *J. Bombay nat. Hist. Soc.*, **26** : 384-416.
- HINTON, M. A. C. & FRY, T. B. 1923. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 37, Nepal. *J. Bombay nat. Hist. Soc.*, **24** : 399-428.
- HINTON, M. A. C. & LINDSAY, H. M. 1926a. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 41. Assam and Mishmi Hills. *J. Bombay nat. Hist. Soc.*, **31** : 383-402.
- HINTON, M. A. C. & LINDSAY, H. M. 1926b. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Supplement to Report No. 41. *J. Bombay nat. Hist. Soc.*, **31** : 402-403.
- HONACKI, J. H., KINMAN, K. E. & KOEPL, J. W. (Eds.). 1982. *Mammal species of the World : a taxonomic and geographic reference*. Lawrence, Kansas, U.S.A. (Allen Press, Inc. and The Association of Systematic Collections).
- HORSFIELD, T. 1851. *A catalogue of the Mammalia in the Museum of the Hon. East-India Company*. London (East-India Company).
- HUTTON, T. 1872. On the bats of the northwestern Himalayas. With notes and corrections in nomenclature by Prof. W. Peters, C. M. Z. S. *Proc. zool. Soc. Lond.*, : 690-714.
- JENKINS, P. W. 1926. Variation in the Eurasian Shrew of the genus *Crocidura* (Insectivora : Soricidae). *Bull. Br. Mus. nat. Hist. (Zool.)*, **30** : 209-303.
- JERDON, T. C. 1867. *The mammals of India : a natural history of the animals known to inhabit continental India*. Roorkee (Author).

- KEMP, S. 1924. The Siju Cave, Garo Hills, Assam. Part II. Notes on the mammals of the Siju Cave, Garo Hills, Assam. *Rec. Indian Mus.*, **26** : 23-25.
- KHAJURIA, H. 1953. Taxonomic studies on some Indian Chiroptera. *Rec. Indian Mus.*, **50** : 113-128.
- KHAJURIA, H. 1963. Field observations on the habits of the Capped Langur and the Barking Deer in the Garo Hills, Assam. *Rec. Indian Mus.*, **58** : 121-122.
- KHAJURIA, H. 1966. Some observations on the habits of Assamese Macaque. *Proc. 2nd All India Congr. Zool.*, Calcutta, pt. **2** : 284.
- KHAJURIA, H. 1979. Studies on the bat (Chiroptera : Mammalia) of M.P., India. Pt. 1. (Families Pteropidae, Rhinopomatidae and Emballonuridae). *Rec. zool. Surv. India, Occ. Pap. No. 13* : 1-59.
- KHAJURIA, H. & GHOSE, R. K. 1970. On a collection of a small mammals from Darjeeling district, West Bengal. *J. Beng. nat. Hist. Soc.*, **36** : 15-36.
- KHAJURIA, H., CHATURVEDI, Y. & GHOSAL, D. K. 1977. Catalogue Mammaliana. *Rec. zool. Surv. India, Occ. Pap. No. 7*, pp. 1-44.
- KHAN, M. A. R. 1982. *Wildlife of Bangladesh : a checklist*, Dhaka (University of Dhaka).
- KOOPMAN, K. F. 1989. Distributional patterns of Indo-Malayan bats (Mammalia : Chiroptera). *Amm. Mus. Novit.*, No. **2942** : 1-19.
- KURUP, G. U. 1966. Mammals of Assam and adjoining areas. 1. An analytical study. *Proc. zool. Soc., Calcutta*, **19** : 1-21.
- KURUP, G. U. 1968. Mammals of Assam and adjoining areas. 2. A distributional list. *Proc. zool. Soc., Calcutta*, **21** : 79-99.
- LAL, J. P. 1981. First report of the Rufous Horseshoe Bat, *Rhinolophus rouxi rouxi* Temminck [Chiroptera : Rhinolophidae] from Burma. *Bull. zool. Surv. India*, **4** : 389.
- LAL, J. P. 1983. Andersen's Rufous Horseshoe Bat, *Rhinolophus rouxi sinicus* Anderson (Chiroptera : Rhinolophidae) from Arunachal Pradesh, India. *J. Bombay nat. Hist. Soc.*, **79** : 402.
- LEKAGUL, B. & MCNEELY, J. A. 1977. *Mammals of Thailand*. Bangkok (Association for the Conservation of Wildlife; Sahakarnbhat Co.).
- LINDSAY, H. M. 1929. Scientific results from the Mammal Survey No. XLVIII. Indian Shrews. *J. Bombay nat. Hist. Soc.*, **33** : 326-340.
- MANDAL, A. K. and DAS, P. K. 1970. Taxonomic notes on the Szechuan Burrowing Shrew, *Annourosorex squamipes* Milne-Edwards from India. *J. Bombay nat. Hist. Soc.*, **66** : 608-612.
- MANDAL, AJOY KUMAR, 1981. Report on the occurrence of the Little Indian Field Mouse, *Mus booduga booduga* (Gray) in Arunachal Pradesh, India. *Bull. zool. Surv. India*, **3(3)** : 271-272.
- MANDAL, AJOY KUMAR, 1982. Rodents of Sikkim. *Rodent Newsl.*, **6(2)** : 10-11.
- MANDAL, AJOY KUMAR, Poddar, A. K. and Bhattacharyya, T. P. 1993. Records of *Megaerops niphanae* Yenbutra & Felten, 1983. (Chiroptera : Pteropodidae), *Hipposideros lankadiva* Kelaart, 1850 and *Hipposideros armiger armiger* (Hodgson, 1835) (Chiroptera : Rhinolophidae) from Manipur, India, with taxonomic notes. *Rec. zool. Surv. India*, **93(3-4)** : 355-359.

- MANDAL, AJOY KUMAR, PODDAR, A. K. and Bhattacharyya, T. P. 1994. Occurrence of the Szechuan Burrowing Shrew, *Anourosorex squamipes squamipes* Milne-Edwards, 1872 (Mammalia : Insectivora : Soricidae) in Manipur, India, with taxonomic notes. *Sci. Cult.*, **60**(1-6) : 55-56.
- MASON, G. E. 1908. On the fruit bats of the genus *Pteropus* inhabiting the Andaman and Nicobar Archipelagos, with the description of a new species. *Rec. Indian Mus.*, **2** : 159-166.
- MEDWAY, LORD. 1978. *The wild mammals of Malaya (Peninsular Malaysia) and Singapore*, 2nd ed. Kuala Lumpur (Oxford University Press).
- MILLS, J. P. 1923. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 36. Naga Hills. *J. Bombay nat. Hist. Soc.*, **29** : 221-229.
- MITCHELL, R. M. 1980. New records of bats (Chiroptera) from Nepal. *Mammalia*, **44** : 339-342.
- MOORE, J. C. & TATE, G. H. H. 1965. A study of the diurnal squirrel, Sciuridae, of India and Indo-Chinese subspecies, *Fieldiana, Zool.* **48** : 1-351.
- MUKHERJEE, R. P. 1975. Report on the brow-antlered deer of Manipur. *Mimeo*, 6 pp.
- MUKHERJEE, R. P. 1977. Effects of crowding on temple rhesus monkeys of Imphal, Manipur. *J. Bombay nat. Hist. Soc.*, **74** : 272-281.
- MUKHERJEE, R. P. 1979. Manipur deer and its present status. *Zoologiana*, No. **2** : 63-67.
- MUKHERJEE, R. P. 1984. Breeding behaviour of Brow-Antlered deer of Manipur. *Rec. zool. Surv. India*, **81** (3-4) : 77-80.
- PHILLIPS, C. J. 1967. A collection of bats from Laos. *J. Mammal.*, **48** : 633-636.
- PHILLIPS, G. J. and WILSON, N. 1968. A collection of bats from Hong Kong. *J. Mammal.*, **49** : 128-133.
- PHILLIPS, W. W. A. 1935. *Manual of the mammals of Ceylon*. Ceylon and London (Colombo Museum, and Dulau and Co. Ltd.).
- PILLAI, R. S. 1973. Record of the Slow Loris, *Nycticebus coucang* (Bod.) from Meghalaya. *J. Assam Sci. Soc.*, **16** : 206-207.
- PILLAI, R. S. 1980. Outbreak of rat populations in India with special reference to Northeastern Region. In : A. K. Ghosh (ed.). *Studies on rodents and their control*. Shillong (Meghalaya Science Society). : pp. 59-65.
- PILLAI, R. S. and BISWAS, S. 1972. Notes on the Yellow-bellied Weasel, *Mustela kathia* Hodgson (Mustelidae) from Khasi Hills, Assam. *J. Bombay nat. Hist. Soc.*, **68** : 817-818.
- POCOCK, R. I. 1939. *The fauna of British India, including Ceylon and Burma. Mammalia*. Vol. I. *Primates and Carnivora* (in part). London (Taylor and Francis).
- POCOCK, R. I. 1941. *The fauna of British India, including Ceylon and Burma. Mammalia*. Vol. II. *Carnivora*. London (Taylor and Francis).
- PRAKASH, I. 1956. A list of mammals of the Rajasthan Desert. *J. Beng. nat. Hist. Soc.*, **28** : 1-7.
- PRATER, S. H. 1980. *The Book of Indian Animals*. 3rd ed. Bombay Natural History Society, Bombay.
- RAJAGOPAL, A. S., MANDAL, A. K. and BISWAS, S. 1966. A note on the breeding habits of the White-bellied Rat, *Rattus niviventer mentosus* Thomas. *J. Bombay nat. Hist. Soc.*, **62** : 546-547.

- RAMAKANTHA, V. 1991. A note on Slow Loris survival in N. E. India with particular reference to native beliefs about its curative and culinary properties. *Zoos' Print*, August 1991, : p. 16.
- RAMAKANTHA, V. 1991. A note on Himalayan Black Bear in Manipur. *Zoos' Print*, October 1991, : 7.
- RAMAKANTHA, V. 1992. Ferret Badger (*Melogale* spp.) in Manipur and a report on the birth of Badger cubs in captivity. *Zoos' Print*, February 1992, : 16-17.
- RANJITSINGH, M. K. 1975. Keibul Lamjao Sanctuary and the Brow-antlered deer—1972, with notes on a visit in 1975. *J. Bombay nat. Hist. Soc.*, **72**(2) : 243-255.
- ROBERTS, T. J. 1977. *The mammals of Pakistan*, London and Tonbridge (Ernest Benn Ltd.).
- ROMER, J. D. 1960. Bats known from Hong Kong. *Mem, Hong Kong nat. Hist. Soc.*, **4** : 1-4.
- ROOKMAAKER, L. C. and BERGMANS, W. 1981. Taxonomy and geography of *Rousettus amplexicaudatus* (Geoffroy, 1810) with comparative notes on sympatric congeners (Mammalia: Megachiroptera). *Beaufortia*, **31** : 1-29.
- ROONWAL, M. L. 1948. Three new muridae (Mammalia : Rodentia) from Assam and the Kabaw Valley, Upper Burma. *Proc. natn. Inst. Sci. India, Calcutta*, **14**(9) : 385-387.
- ROONWAL, M. L. 1949a. Contributions to the fauna of Manipur State, Assam. Part I. General Introduction. *Rec. Indian Mus.* **46**(1-4) : 123-126.
- ROONWAL, M. L. & NATH, B. 1949b. Discontinuous distribution of certain Indo-Malayan mammals and its zoogeographical significance. *Proc. natn. Inst. Sci. India, Calcutta*, **15** : 275-277.
- ROONWAL, M. L. 1949c. Systematics, ecology and bionomics of mammals studied in connection with Tautsugamushi Disease (Scrub Typhus) in the Assam-Burma war theatre during 1945. *Trans. natn. Inst. Sci. India, Calcutta*, **3**(2) : 67-122, 6 pls., 15 tables.
- ROONWAL, M. L. 1950. Contribution to the fauna of Manipur State, Assam, Part III. Mammals, with special reference to the family Muridae (Order Rodentia). *Rec. Indian Mus.*, **47**(1) : 1-64.
- ROONWAL, M. L. & BISWAS, B. 1961. *Addition to J. R. Ellerman's volume on Mammalia (2nd ed.)*. Vol. 3. Rodentia in the 'Fauna of India' series pp. 853-867. Govt. of India, New Delhi.
- ROONWAL, M. L. and GUHA-ROY, S. 1966. Variability in size of body parts and skull in the Manipur Rat, *Rattus rattus bullocki*. *J. zool. Soc. India, Calcutta*, **18**(1-2) : 46-68.
- SAHA, S. S. 1980. A supplementary note on some mammals recently collected in Bhutan. *J. Bombay nat. Hist. Soc.*, **76** : 155-156.
- SAHA, S. S. 1985. Mammalia. In : Fauna of Namdapha : Proposed Biosphere Reserve. *Rec. zool. Surv. India*, **82** : 321-330.
- SAPKAL, V. M. and BHANDARKAR, W. R. 1984. Breeding habits and associated phenomena in some Indian bats. Part IX-*Hipposideros lankadiva* (Kelaart)—Hipposideridae. *J. Bombay nat. Hist. Soc.*, **81** : 380-386.
- SCHLITTER, D. and THONGLONGYA, K. 1971. *Rattus turkestanicus* (Satunin, 1903)—the valid name for *Rattus rattoides* Hodgson, 1845 (Mammalia : Rodentia). *Proc. biol. Soc. Wash.*, **84** : 171-174.
- SCLATER, W. L. 1891. *Catalogue of Mammalia in the Indian Museum, Calcutta*. Part II. Calcutta (Indian Museum).
- SCULLY, J. 1888. On the Chiroptera of Nepal. *J. Asiat. Soc. Beng.*, **56** : 233-259.

- SHARMA, B. D. & SHARMA, T. 1976. Some mammals records for Jammu province (J & K state). *Indian Poult. Rev.*, **8**(3) : 15-17.
- SIDDIQI, M. S. U. 1961a. Checklist of mammals of Pakistan with particular reference to the mammalian collection in the British Museum (Natural History), London. *Biologia, Lahore*, **7** : 93-225.
- SIDDIQI, M. S. U. 1961b. Notes on the status of bats of the genus *Scotophilus* from southern Asia with key to the recognised forms. *Ann. Mag. nat. Hist.*, (13)**3** : 449-454.
- SIDDIQI, M. S. U. 1969. *Fauna of Pakistan*. Karachi (Govt. of Pakistan).
- SINHA, Y. P. 1969a. Taxonomic status of *Rousettus seminudus* (Gray) : (Chiroptera : Pteropidae). *J. Bombay nat. Hist. Soc.*, **65** : 764-767.
- SINHA, Y. P. 1969b. A new pipistrelle bat (Mammalia : Chiroptera : Vespertilionidae) from Burma. *Proc. zool. Soc., Calcutta*, **22** : 83-86.
- SINHA, Y. P. 1970. Taxonomic notes on some Indian bats. *Mammalia*, **34** : 81-92.
- SINHA, Y. P. 1973. Taxonomic studies on the Indian horseshoe bats of the genus *Rhinolophus* Lacepède. *Mammalia*, **37** : 603-630.
- SINHA, Y. P. 1977. The Oriental bats of the genus *Megaderma* (Megadermatidae). *Geobios*, Jodhpur, **4**(1) : 9-12.
- SINHA, Y. P. 1980. The bats of Rajasthan : taxonomy and zoogeography. *Rec. zool. Surv. India*, **76** : 7-63.
- SINHA, Y. P. 1990a. Occurrence of Dobson's Long-tongued Fruit Bat *Eonycteris spelaea* (Dobson, 1871) (Chiroptera : Pteropodidae) in Meghalaya. *J. Bombay nat. Hist. Soc.*, **37** : 134-135.
- SUBIAH, K. S. and SINGH, K. D. 1984. Record of *Bandicota bengalensis* from Imphal, Manipur. *Rodent Newsl.*, Jodhpur, **8**(1-4) : 13-14.
- TATE, G. H. H. 1942. Results of the Archbold Expeditions. No. 47. Review of the vespertilionine bats, with special attention to genera and species of the Archbold Collections. *Bull. Am. Mus. nat. Hist.*, **80** : 221-297.
- THOMAS, O. 1881. On the mammals presented by Allen O. Hume, Esq., C. B., to the Natural History Museum. *Proc. zool. Soc.*, London, 1886, : 54-79, 2 pls.
- THOMAS, O. 1915. On bats of the genus *Nyctalus*, *Tylonycteris*, and *Pipistrellus*. *Ann. Mag. nat. Hist.*, (8) **15** : 225-232.
- THOMAS, O. 1916a. Scientific Results from the Mammal Survey. No. XIII.A.—On Muridae from Darjiling and the Chin Hills. *J. Bombay nat. Hist. Soc.*, **24** : 404-415.
- THOMAS, O. 1916b. Scientific Results from the Mammal Survey. No. XIII. B.—Two new Indian bats. *J. Bombay nat. Hist. Soc.*, **24** : 415-417.
- THOMAS, O. 1916c. Scientific Results from the Mammal Survey. No. XIV. (A).—A new bat of the genus *Murina* from Darjiling. *J. Bombay nat. Hist. Soc.*, **24** : 639-640.
- THOMAS, O. 1920. Scientific Results from the Mammal Survey. No. XXIII. A new bat of the genus *Myotis* from Sikkim. *J. Bombay nat. Hist. Soc.*, **27** : 248-249.
- THOMAS, O. 1922. Scientific Results of the Mammal Survey. No. XXXII. (A). New and interesting mammals from the Mishmi Hills. *J. Bombay nat. Hist. Soc.*, **28** : 428-431.

- TIKADER, B. K. 1983. *Threatened animals of India*. Calcutta (Zoological Survey of India).
- WANG, S., LU, C., KAO, Y and LOO, T. 1962. On the mammals from southwestern Kwangsi, China. *Acta. zool. Sin.*, **14** : 555-568 + 2 pls.
- WALTON, D. W. 1974. New records of bats (Chiroptera) from Pakistan. *J. mammal. Soc. Japan*, **6**(2) : 43-50.
- WARD, A. E. 1905. Notes on small mammals in Kashmir and adjacent district. *J. Bombay nat. Hist. Soc.*, **28** : 45-49.
- WILSON, Don E. and REEDER, Dee Ann M. 1992. *Mammal species of the World. A Taxonomic and Geographic Reference*. Second edition. Washington and Longon (Smithsonian Institute Press).
- WROUGHTON, R. C. 1913. Bombay Natural History Society's Mammal Survey of India. *J. Bombay nat. Hist. Soc.*, **22** : 29-44.
- WROUGHTON, R. C. 1915. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 19. *J. Bombay Nat. Hist. Soc.*, **24** : 96-110.
- WROUGHTON, R. C. 1916. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 22. *J. Bombay nat. Hist. Soc.*, **24** : 311-316.
- WROUGHTON, R. C. 1918a. Summary of the results from the Indian Mammal Survey of the Bombay Natural History Society. *J. Bombay nat. Hist. Soc.*, **25** : 547-598.
- WROUGHTON, R. C. 1918b. Summary of the results from the Indian Mammal Survey of the Bombay Natural History Society. Part II. *J. Bombay nat. Hist. Soc.*, **26** : 19-58.
- WROUGHTON, R. C. 1921. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 34. Travancore. *J. Bombay nat. Hist. Soc.*, **27** : 549-553.

District-wise distribution of mammals in Manipur

Sl. No.	Systematic List	SENAPATI	TAMENGLONG	IMPHAL	UKHRUL	BISHENPUR	THOUBAL	CHURACHANDPUR	CHANDEL
1.	Order SCANDENTIA Family TUPAIIDAE <i>Tupaia belangeri assamensis</i> Wroughton	+							+
2.	Order INSECTIVORA Family TALPIDAE <i>Talpa micrura</i> Hodgson			+					
3.	Family SORICIDAE <i>Soriculus caudatus caudatus</i> (Horsfield)			+					
4.	<i>Suncus murinus griffithi</i> (Horsfield)	+	+	+	+			+	
5.	<i>Suncus murinus fulvocinereus</i> (Anderson)			+					
6.	<i>Crocidura attenuata rubricosa</i> Anderson				+				
7.	<i>Anourosorex squamipes</i> Milne-Edwards	+	+		+				
8.	Order CHIROPTERA Family PTEROPODIDAE <i>Rousettus leschenaulti leschenaulti</i> (Desmarest)	+	+	+					
9.	<i>Pteropus giganteus giganteus</i> (Brünnich)			+					

Table Contd.

Sl. No.	Systematic List	SENAPATI	TAMENGLONG	IMPHAL	UKHRUL	BISHENPUR	THOUBAL	CHURACHANDPUR	CHANDEL
10.	<i>Cynopterus sphinx sphinx</i> (Vahl)		+	+				+	
11.	<i>Megaerops niphanae</i> Yenbutra & Felten		+	+					
12.	<i>Eonycteris spelaea</i> (Dobson)			+					
	Family RHINOLOPHIDAE								
13.	<i>Hipposideros armiger armiger</i> (Hodgson)		+						
14.	<i>Hipposideros lankadiva</i> Kelaart			+					
	Family VESPERTILIONIDAE								
15.	<i>Pipistrellus coromandra coromandra</i> (Gray)			+					
16.	<i>Pipistrellus mimus</i> Wroughton			+					
17.	<i>Scotozous dormeri</i> Dobson			+					
18.	<i>Tylonycteris pachypus fulvida</i> (Blyth)			+					
19.	<i>Scotophilus heathi heathi</i> (Horsfield)			+					
	Order PRIMATES								
	Family LORIDAE								
20.	<i>Nycticebus coucang bengalensis</i> (Lacépède)								+
	Family CERCOPITHECIDAE								
21.	<i>Macaca mulatta mulatta</i> (Zimmermann)			+					

Table Contd.

Sl. No.	Systematic List	SENAPATI	TAMENGLONG	IMPHAL	UKHRUL	BISHENPUR	THOUBAL	CHURACHANDPUR	CHANDEL
22.	<i>Macaca assamensis assamensis</i> (M'clelland)			+					
23.	<i>Macaca arctoides</i> (I. Geoffroy)								+
24.	<i>Presbytis pileatus pileatus</i> (Blyth)	+							
25.	Family HYLOBATIDAE <i>Hylobates hoolock</i> (Harlan)	+							
26.	Order PHOLIDOTA Family MANIDAE <i>Manis pentadactyla aurita</i> Hodgson								+
27.	Order CARNIVORA Family CANIDAE <i>Canis aureus indicus</i> Hodgson			+	+				+
28.	<i>Vulpes bengalensis</i> (Shaw)	+		+					+
29.	Family FELIDAE <i>Felis chaus</i> Güldenstaedt	+		+					
30.	<i>Felis bengalensis bengalensis</i> Kerr			+					
31.	Family HERPESTIDAE <i>Herpestes urva</i> (Hodgson)	+							

Table Contd.

Sl. No.	Systematic List	SENAPATI	TAMENGLONG	IMPHAL	UKHRUL	BISHENPUR	THOUBAL	CHURACHANDPUR	CHANDEL
32.	<i>Herpestes auropunctatus</i> (Hodgson)	+		+		+		+	+
	Family MUSTELIDAE								
33.	<i>Martes flavigula flavigula</i> (Boddaert)			+					+
34.	<i>Mustela kathiah</i> Hodgson	+							
35.	<i>Melogale moschata millsi</i> (Thomas)								+
36.	<i>Arctonyx collaris collaris</i> F. Cuvier			+					+
	Family URSIDAE								
37.	<i>Selenarctos thibetanus</i> (G. Cuvier)	+			+			+	+
	Family VIVERRIDAE								
38.	<i>Viverra zibetha zibetha</i> Linnaeus								+
39.	<i>Viverricula indica indica</i> (Desmarest)			+					
40.	<i>Paradoxurus hermaphroditus</i> (Pallas)			+					
41.	<i>Paguma larvata neglecta</i> Pocock								+
	Order ARTIODACTYLA								
	Family SUIDAE								
42.	<i>Sus scrofa cristatus</i> Wagner	+		+					+

Table Contd.

Sl. No.	Systematic List	SENAPATI	TAMENGLONG	IMPHAL	UKHRUL	BISHENPUR	THOUBAL	CHURACHANDPUR	CHANDEL
43.	Family CERVIDAE <i>Muntiacus muntjak vaginalis</i> (Boddaert)			+					
44.	<i>Cervus eldi eldi</i> M'Clelland					+			
45.	Order RODENTIA Family SCIURIDAE <i>Belomys pearsoni trichotis</i> Thomas								+
46.	<i>Petaurista alborufus candidulus</i> Wroughton		+						
47.	<i>Hylopetes phayrei phayrei</i> (Blyth)								+
48.	<i>Hylopetes alboniger alboniger</i> (Hodgson)	+			+				
49.	<i>Callosciurus erythraeus erythrogaster</i> (Blyth)	+	+	+					+
50.	<i>Callosciurus phygerythrus blythi</i> (Tytler)	+		+					+
51.	<i>Tamiops macclellandi macclellandi</i> (Horsfield)		+	+	+				+
52.	<i>Dromomys lokriah macmillani</i> Thomas	+	+	+					
53.	<i>Ratufa bicolor gigantea</i> (M'clelland)		+						
54.	Family HYSTRICIDAE <i>Hystrix brachyura</i> Linnaeus	+							

Table Contd.

Sl. No.	Systematic List	SENAPATI	TAMENGLONG	IMPHAL	UKHRUL	BISHENPUR	THOUBAL	CHURACHANDPUR	CHANDEL
55.	Family RHIZOMYIDAE <i>Rhizomys pruinosus pruinosus</i> (Blyth)		+			+			
56.	<i>Cannomys badius badius</i> (Hodgson)		+			+			
57.	Family MURIDAE <i>Chiropodomys gliroides gliroides</i> (Blyth)	No mention of exact locality							
58.	<i>Vandeleuria oleracea dumeticola</i> (Hodgson)		+			+			
59.	<i>Hadromys humei</i> (Thomas)	+				+			
60.	<i>Rattus rattus brunneusculus</i> (Hodgson)					+			
61.	<i>Rattus rattus bullocki</i> Roonwal	+							+
62.	<i>Rattus rattus tistae</i> Hinton	+	+		+	+		+	+
63.	<i>Rattus nitidus obsoletus</i> Hinton	+	+						
64.	<i>Rattus mackenziei</i> Thomas		+			+			
65.	<i>Rattus manipulus manipulus</i> (Thomas)	+		+		+			
66.	<i>Niviventer niviventer niviventer</i> (Hodgson)								+
67.	<i>Niviventer niviventer mentosus</i> (Thomas)			+					
68.	<i>Mus musculus castaneus</i> Waterhouse	+							
69.	<i>Mus musculus homourus</i> Hodgson	+							

Table Contd.

Sl. No.	Systematic List	SENAPATI	TAMENGLONG	IMPHAL	UKHRUL	BISHENPUR	THOUBAL	CHURACHANDPUR	CHANDEL
70.	<i>Mus musculus urbanus</i> Hodgson	+		+				+	
71.	<i>Mus cervicolor imphalensis</i> Roonwal	+							
72.	<i>Mus famulus cooki</i> Ryley								+
73.	<i>Diomys crumpi</i> Thomas					+			
74.	<i>Bandicota bengalensis bengalensis</i> (Gray)	+		+					+
75.	<i>Bandicota indica nemorivaga</i> (Hodgson)			+					

AVES

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INTRODUCTION

Manipur is a small montane state in the extreme east of India on the Myanmar Frontier being one of the cluster of seven sister states of the north-eastern Hills. It shares an international border with Myanmar on the east, while the states of Assam, Nagaland and Mizoram border it in the West, north and south respectively. A roughly rectangular cartographic area of about 21899.74 sq. kilometres spreading over 23°50' and 25°41' N latitudes and 93°2' and 94°47' E longitudes constitute the state.

The terrain lies between 700 and 2000 metres above the mean sea level. Several hill ranges running north-south abridging the Patkoi Hill range and the Lushai Hill range of the extended Arakan Yoma. But have a wide plain valley of Imphal roughly 48.27 km long and 31.18 km wide, having several lakes includes distinctive Loktak Lake.

Two principal rivers namely, Barak and Imphal (or Manipur) carry the drainage with their tributaries. The former following in the north-western section running north-south, then abruptly running west to flow into the Barak Valley of Assam thence to the mighty Brahmaputra river, while the later flowing north-south across the Imphal valley thence through Chin Hills to meet the Chindwin river.

Climate of the Imphal Valley is mild with cool summers and cold, but not severe, winters. Temperature varies between 33.3°C and -1.1°C. But, higher hilly sections are much colder. Average

annual rainfall at Imphal is about 177.8 cm chiefly received during the monsoon months of June to September. But in the thrust areas of the hills receive much precipitation as much as 254 cm annually.

So far natural vegetation is concerned Tropical West Evergreen Forests extend in the monsoon thrust areas of the west and north-west. Tropical Dry Deciduous Forests extend along the eastern section of the rain shed areas. Tropical Moist Deciduous Forests extend over larger areas in between, when subtropical pine Forests extend on the southern section as well as northern section of the state. Montane West Temperate Forests are distributed along the higher section of the north-eastern hills. Arable Land are extending along the central part of the state. The forest area occupies 67.9% of the total area of the state—a comfortable and healthy sign. And categorized as Reserved Forests (9.6%), protected Forests (27.5%) and Unclassified (62.9%). The last category also conform 'private Forest' Flat Manipur Valley having several natural lakes have typical swampy vegetation. Loktak Lake has the peculiar floating vegetation known as 'phundi' Zoogeographically, Manipur lies in the juncture of Malayan and Indo-Chinese Subregion of the Oriental Region of the Megalayan Realm and its geographical location bears significant importance. And its ecosystems constitute mainly that of north-eastern Hill States of India with the significant speciality of the 'phundi' of the wetland system.

Due to the nature of the terrain and also due to location the Manipur state was sporadically surveyed over the last two centuries. Godwin-

Austen (1874-82) appears to have provided the first systematic account of birds for the state in his treatise on north-eastern Hill region. Hume (1888) listed about 500 species, Oates (1883-90) referred Manipur in his account on birds of Burma. Allen (1905) provided brief accounts on game birds. Higgins (1913, 1914, 1933-34) made elaborate reference to birds of Manipur. Zoological survey undertook field surveys during 1936, and Roonwal made an extensive survey during 1945. In 1948 Roonwal in his contribution to Manipur Fauna accounted 91 bird species with the description of a new subspecies of bird namely, *Otus bakkamoena manipurensis*, the Manipur Scops Owl, In recent times, under the auspices of "State Fauna" assignments, several teams conducted field surveys in the state including those for ornithological surveys during nineties of this century.

DETAILS OF COLLECTORS AND LOCALITIES

Collector

Maj. M. I. Roonwal 1. 6 miles N. of Imphal (c. 2800 ft.)

2. Kanglatongbi, 16 miles N. of Imphal (c. 3500 ft.)

3. Imphal Valley

4. Regailons camp, Imphal (3,250 ft- 2,500 ft.)

Shir D. K. Ghosal 1. Imphal

2. Jiribam, Manipur

3. Chandal, Manipur

4. Churachandpur, Manipur

Shri A. K. Mondal 1. Uchathol, Jiribam, Manipur

2. Turibari (c. 1250 mt.), Kangpokpi, Senapati, Manipur

3. Tamenglong (c. 1280 mt.) Manipur.

From Higgins' report it is apparent that during the late part of 19th century and early decade of

20th century British personnels collected hundreds of game birds in Manipur. Following tables as given by Higgins in his paper is reproduced here just to show abundance of Game birds in Manipur. It is needless to point out that such wanton killing of beautiful birds only to improve the delicacy of the dining table and charishma of individual gun power in the name of sports at the cost of countless Game birds which are, at present, living in very small numbers or not living at all in Manipur.

SYSTEMATIC LIST OF BIRDS

(As reported in this paper)

Order PODICIPEDIFORMES

Family PODICIPEDIDAE

1. *Podiceps cristatus cristatus* (Linnaeus)

2. *Podiceps ruficollis capensis* Salvadori

Order PELICANIFORMES

Family PHALACROCORACIDAE

3. *Phalacrocorax carbo sinensis* (Shaw)

4. *Phalacrocorax niger* (Vieillot)

5. *Anhinga rufa melanogaster* Pennant

Order CICONIIFORMES

Family ARDEIDAE

6. *Ardea cinerea rectirostris* Gould

7. *Ardea purpurea manilensis* Meyen

8. *Ardeola striatus chloriceps* (Bonaparte)

9. *Burtorides striatus javanicus* (Horsfield)

10. *Ardeola grayii grayii* (Sykes)

11. *Ardeola bacchus* (Bonaparte)

12. *Bubulcus ibis coromandus* (Boddaert)

13. *Egretta intermedia intermedia* (Wagler)

14. *Egretta garzetta garzetta* (Linnaeus)

15. *Nycticorax nycticorax nycticorax* (Linnaeus)

16. *Gorsachius melanolophus melanolophus* (Raffles)

17. *Ixobrychus cinnamomeus* (Gmelin)

18. *Ixobrychus sinensis* (Gmelin)

19. *Ixobrychus flavicollis flavicollis* (Latham)

Family CICONIIDAE

20. *Mycteria leucocephala* (Pennant)
 21. *Anastomus oscitans* (Boddaert)
 22. *Ciconia episcopus episcopus* (Boddaert)

Family THRESKIORNITHIDAE

23. *Threskiornis aethiopica melanocephala* (Latham)
 24. *Platalea leucorodia major* Temminck & Schlegel

Order ANSERIFORMES

Family ANATIDAE

25. *Anser albifrons albifrons* (Scopoli)
 26. *Anser anser rubrirostris* Swinhoe
 27. *Dendrocygna javanica* (Horsfield)
 28. *Dendrocygna bicolor* (Vieillot)
 29. *Tadorna ferruginea* (Pallas)
 30. *Tadorna tadorna* (Linnaeus)
 31. *Anas acuta* Linnaeus
 32. *Anas crecca crecca* Linnaeus
 33. *Anas formosa* Georgi
 34. *Anas poecilorhyncha zonorhyncha* Swinhoe
 35. *Anas strepera strepera* Linnaeus
 36. *Anas falcata* Georgi
 37. *Anas penelope* Linnaeus
 38. *Anas querquedula* Linnaeus
 39. *Anas clypeata* Linnaeus
 40. *Aythya ferina* (Linnaeus)
 41. *Aythya nyroca* (Guldenstadt)
 42. *Aythya baeri* (Radde)
 43. *Aythya fuligula* (Linnaeus)
 44. *Aix galericulata* (Linnaeus)
 45. *Nettapus coromandelianus coromandelianus* (Gmelin)
 46. *Cairina scutulata* (S. Muller)
 47. *Bucephala clangula clangula* (Linnaeus)

Order FALCONIFORMES

Family ACCIPITRIDAE

48. *Elanus caeruleus vociferus* (Latham)
 49. *Aviceda leuphotes syama* (Hodgson)
 50. *Pernis ptilorhynchus ruficollis* Lesson

51. *Milvus migrans govinda* Sykes
 52. *Milvus migrans lineatus* (Gray)
 53. *Haliastur indus indus* (Boddaert)
 54. *Accipiter badius dussumieri* (Temminck)
 55. *Accipiter nisus nisosimilis* (Tickell)
 56. *Buteo buteo japonicus* (Temminck & Schlegel)
 57. *Spizaetus nipalensis nipalensis* (Hodgson)
 58. *Hieraaetus kienerii kienerii* (E. Geoffroy)
 59. *Aquila clanga* Pallas
 60. *Aquila pomarina hastata* (Lesson)
 61. *Sarcogyps calvus* (Scopoli)
 62. *Gyps bengalensis* (Gmelin)
 63. *Circus macrourus* (S. G. Gmelin)
 64. *Circus melanoleucos* (Pennant)
 65. *Circus aeruginosus aeruginosus* (Linnaeus)
 66. *Circus aeruginosus spilonotus* Kaup
 67. *Spilornis cheela burmanicus* Swann
 68. *Pandion haliaetus haliaetus* (Linnaeus)

Family FALCONIDAE

69. *Microhierax caerulenscens caerulescens* (Linnaeus)
 70. *Microhierax melanoleucos* (Blyth)
 71. *Falco biarmicus jugger* J. E. Gray
 72. *Falco peregrinus japonensis* Gmelin
 73. *Falco subbuteo centralasiae* (Buturlin)
 74. *Falco severus severus* Horsfield
 75. *Falco chicquera chicquera* Daudin
 76. *Falco vespertinus amurensis* Radde
 77. *Falco naumanni Fleischer*
 78. *Falco tinnunculus interstinctus* McClelland

Order GALLIFORMES

Family PHASIANIDAE

79. *Francolinus francolinus melanotus* Hume
 80. *Francolinus pintadeanus phayrei* (Blyth)
 81. *Coturnix coturnix coturnix* (Linnaeus)
 82. *Coturnix coturnix japonica* Temminck & Schlegel

83. *Coturnix coromandelica* (Gmelin)
 84. *Coturnix chinensis chinensis* (Linnaeus)
 85. *Perdicula manipurensis manipurensis* Hume
 86. *Arborophila torqueola interstincta* Ripley
 87. *Arborophila rufogularis intermedia* (Blyth)
 88. *Arborophila atrogularis* (Blyth)
 89. *Bambusicola fytchii hopkinsoni* Godwin-Austen
 90. *Tragopan blythii blythii* (Jerdon)
 91. *Lophura leucomelana lathamii* (J. E. Gray)
 92. *Lophura leucomelana williamsi* (Oates)
 93. *Syrnaticus humiae humiae* (Hume)
 94. *Polyplectron bicalcaratum bakeri* Lowe
 95. *Pavo cristatus* Linnaeus
- Order GRUIFORMES
 Family TURNICIDAE
96. *Turnix sylvatica dussumieri* (Temminck)
 97. *Turnix tanki blanfordii* Blyth
- Family GRUIDAE
98. *Grus monacha* Temminck
 99. *Grus antigone sharpii* Blanford
 100. *Rallus striatus albiventer* Swainson
 101. *Porzana pusilla pusilla* (Pallas)
 102. *Amaurornis fuscus bakeri* (Hartert)
 103. *Amaurornis bicolor* (Walden)
 104. *Amaurornis phoenicurus phoenicurus* (Pennant)
 105. *Gallicrex cinerea cinerea* (Gmelin)
 106. *Gallinula chloropus indica* (Blyth)
 107. *Porphyrio porphyrio poliocephalus* (Latham)
 108. *Fulica atra atra* Linnaeus
- Family HELIORNITHIDAE
109. *Heliopais personata* (G. R. Gray)
- Order CHARADRIIFORMES
 Family JACANIDAE
110. *Hydrophasianus chirurgus* (Scopoli)
 111. *Metopidius indicus* (Latham)
- Family CHARADRIIDAE
112. *Vanellus vanellus* (Linnaeus)
 113. *Vanellus cinereus* (Blyth)
114. *Vanellus indicus atronuchalis* (Jerdon)
 115. *Vanellus spinosus duvaucelii* (Lesson)
 116. *Pluvialis dominica fulva* (Gmelin)
 117. *Charadrius hiaticula tundrae* (Lowe)
 118. *Charadrius dubius jerdoni* (Legge)
 119. *Charadrius alexandrinus alexandrinus* Linnaeus
 120. *Charadrius mongolus atrifrons* Wagler
 121. *Numenius phaeopus variegatus* (Scopoli)
 122. *Numenius arquata orientalis* C. L. Brehm
 123. *Tringa erythropus* (Pallas)
 124. *Tringa totanus totanus* (Linnaeus)
 125. *Tringa stagnatilis* (Bechstein)
 126. *Tringa nebularia* (Gunnerus)
 127. *Tringa ochropus* Linnaeus
 128. *Tringa glareola* Linnaeus
 129. *Tringa hypoleucos hypoleucos* Linnaeus
 130. *Gallinago solitaria solitaria* Hodgson
 131. *Gallinago nemoricola* Hodgson
 132. *Gallinago stenura* (Bonaparte)
 133. *Gallinago megala* Swinhoe
 134. *Gallinago gallinago gallinago* (Linnaeus)
 135. *Gallinago minima* (Brunnich)
 136. *Scolopax rusticola rusticola* Linnaeus
 137. *Calidris temminckii* (Leisler)
 138. *Philomachus pugnax* (Linnaeus)
- Family ROSTRATULIDAE
139. *Rostratula benghalensis benghalensis* (Linnaeus)
- Family RECURVIROSTRIDAE
140. *Himantopus himantopus himantopus* (Linnaeus)
 141. *Recurvirostra avosetta* Linnaeus
- Family BURHINIDAE
142. *Burhinus oedicnemus indicus* (Salvadori)
 143. *Esacus magnirostris recurvirostris* (Cuvier)
- Family LARIDAE
144. *Larus fuscus fuscus* Linnaeus
 145. *Larus brunnicephalus* Jerdon

208. *Batrachostomus hodgsoni hodgsoni* (G. R. Gray)

Family CAPRIMULGIDAE

209. *Eurostopodus macrotis cerviniceps* (Gould)
 210. *Caprimulgus indicus hazarae* Whistler & Kinnear
 211. *Caprimulgus macrurus bimaculatus* Peale
 212. *Caprimulgus affinis monticola* Franklin

Order APODIFORMES

Family APODIDAE

213. *Collocalia brevirostris brevirostris* (Horsfield)
 214. *Chaetura (Caudacuta) cochinchinensis* Oustalet
 215. *Chaetura gigantea indica* Hume
 216. *Chaetura sylvatica* (Tickell)
 217. *Apus pacificus pacificus* (Latham)
 218. *Apus pacificus leuconyx* (Blyth)
 219. *Apus affinis subfurcatus* (Blyth)
 220. *Cypsiurus parvus infumatus* Sclater
 221. *Hemiprocne longipennis coronata* (Tickell)

Order TROGONIFORMES

Family TROGONIDAE

222. *Harpactes erythrocephalus hodgsonii* (Gould)
 223. *Harpactes erythrocephalus helenae* Mayr
 224. *Harpactes erythrocephalus erythrocephalus* (Gould)

Order CORACIIFORMES

Family ALCEDINIDAE

225. *Ceryle lugubris guttulata* Stejneger
 226. *Ceryle rudis leucomelanura* Reichenbach
 227. *Alcedo hercules* Laubmann
 228. *Alcedo atthis bengalensis* Gmelin
 229. *Alcedo meninting coltarti* Baker
 230. *Ceyx erithacus erithacus* (Linnaeus)
 231. *Pelargopsis capensis capensis* (Linnaeus)
 232. *Halcyon coromanda coromanda* (Latham)
 233. *Halcyon smyrnensis perpulchra* Madarasz
 234. *Halcyon pileata* (Boddaert)

Family MEROPIDAE

235. *Merops leschenaulti leschenaulti* Vieillot

236. *Nyctyornis athertoni athertoni* (Jardine & Selby)

Family CORACIIDAE

237. *Coracias benghalensis affinis* Horsfield
 238. *Eurystomus orientalis cyanicollis* Vieillot

Family UPUPIDAE

239. *Upupa epops longirostris* Jerdon

Family BUCEROTIDAE

240. *Ptilolaemus tickelli austeni* (Jerdon)
 241. *Aceros nipalensis* (Hodgson)
 242. *Rhyticeros undulatus ticehursti* Deignan
 243. *Anthracoceros malabaricus malabaricus* (Gmelin)
 244. *Buceros bicornis homrai* Hodgson

Order PICIFORMES

Family CAPITONIDAE

245. *Megalaima virens magnifica* Baker
 246. *Megalaima lineata hodgsoni* Bonaparte
 247. *Megalaima franklinii franklinii* (Blyth)
 248. *Megalaima asiatica asiatica* (Latham)
 249. *Megalaima australis cyanotis* (Blyth)
 250. *Megalaima haemacephala indica* (Latham)

Family INDICATORIDAE

251. *Indicator xanthonotus fulvus* Ripley

Family PICIDAE

252. *Jynx torquilla chinensis* Hesse
 253. *Picumnus innominatus malayorum* Hartert
 254. *Sasia ochracea reichenowi* Hesse
 255. *Micropternus brachyurus phaiiceps* Blyth
 256. *Picus canus hessei* Gyldenstolpe
 257. *Picus flavinucha flavinucha* Gould
 258. *Picus chlorolophus chlorolophus* Vieillot
 259. *Dinopium benghalense benghalense* (Linnaeus)
 260. *Dinopium shorii shorii* (Vigors)
 261. *Dinopium javanense intermedium* (Blyth)
 262. *Gecinulus grantia grantia* (Horsfield)
 263. *Mulleripicus pulverulentus harterti* Hesse
 264. *Hypopicus hyperythrus hyperythrus* (Vigors)

265. *Picoides major stresemanni* (Rensch)
 266. *Picoides darjellensis* (Blyth)
 267. *Picoides cathpharius pyrrhothorax* (Hume)
 268. *Picoides atratus* (Blyth)
 269. *Picoides macei macei* (Vieillot)
 270. *Picoides canicapillus canicapillus* (Blyth)
 271. *Hemicircus canente canente* (Lesson)
 272. *Blythipicus pyrrhotis pyrrhotis* (Hodgson)
 273. *Chrysocolaptes lucidus guttacristatus* (Tickell)

Order PASSERIFORMES

Family EURYLAIMIDAE

274. *Serilophus lunatus rubropygius* (Hodgson)
 275. *Psarisomus dalhousiae dalhousiae* (Jameson)

Family PITTIDAE

276. *Pitta nipalensis nipalensis* (Hodgson)
 277. *Pitta brachyura brachyura* (Linnaeus)
 278. *Pitta sordida cucullata* Hartlaub
 279. *Pitta cyanea cyanea* Blyth

Family ALAUDIDAE

280. *Mirafrassina assamica assamica* Horsfield
 281. *Eremopterix grisea* (Scopoli)

Family HIRUNDINIDAE

282. *Riparia riparia ijimae* (Lonnberg)
 283. *Hirundo rustica tyleri* Jerdon
 284. *Hirundo striolata mayri* Hall
 285. *Delichon nipalensis nipalensis* Moore

Family LANIIDAE

286. *Lanius collurioides* Lesson
 287. *Lanius tephronotus tephronotus* (Vigors)
 288. *Lanius schach tricolor* (Hodgson)
 289. *Lanius cristatus cristatus* Linnaeus

Family ORIOLIDAE

290. *Oriolus chinensis tenuirostris* Blyth
 291. *Oriolus xanthornus xanthornus* (Linnaeus)
 292. *Oriolus traillii traillii* (Vigors)

Family DICRURIDAE

293. *Dicrurus adsimilis albirictus* (Hodgson)

294. *Dicrurus leucophaeus hopwoodi* Baker
 295. *Dicrurus caerulescens caerulescens* (Linnaeus)
 296. *Dicrurus annectans* (Hodgson)
 297. *Dicrurus aeneus aeneus* Vieillot
 298. *Dicrurus remifer tectirostris* (Hodgson)
 299. *Dicrurus hottentottus hottentottus* (Linnaeus)
 300. *Dicrurus paradiseus grandis* (Gould)

Family ARTAMIDAE

301. *Artamus fuscus* Vieillot

Family STURNIDAE

302. *Saroglossa spiloptera* (Vigors)
 303. *Aplonis panayensis affinis* (Blyth)
 304. *Sturnus malabaricus nemoricola* (Jerdon)
 305. *Sturnus contra superciliaris* (Blyth)
 306. *Sturnus sinensis* (Gmelin)
 307. *Acridotheres tristis tristis* (Linnaeus)
 308. *Acridotheres fuscus fuscus* (Wagler)
 309. *Acridotheres javanicus infuscatus* (Baker)
 310. *Acridotheres albocinctus* Godwin-Austen & Walden

311. *Mino coronatus* (Blyth)
 312. *Gracula religiosa intermedia* A. Hay

Family CORVIDAE

313. *Garrulus glandarius interstinctus* Hartert
 314. *Cissa chinensis chinensis* (Boddaert)
 315. *Cissa erythrorhyncha magnirostris* (Blyth)
 316. *Dendrocitta vagabunda vagabunda* (Latham)
 317. *Dendrocitta frontalis frontalis* Horsfield
 318. *Dendrocitta formosae* Jerdon
 319. *Corvus splendens splendens* Vieillot
 320. *Corvus macrorhynchos levaillanti* Lesson

Family CAMPEPHAGIDAE

321. *Hemipus picatus capitalis* (Horsfield)
 322. *Tephrodornis virgatus pelvica* (Hodgson)
 323. *Coracina melanoptera sykesi* (Strickland)
 324. *Pericrocotus brevirostris brevirostris* (Vigors)
 325. *Pericrocotus ethologus mariae* Ripley

326. *Pericrocotus solaris solaris* Blyth
 327. *Pericrocotus roseus roseus* (Vieillot)
 328. *Pericrocotus cinnamomeus vividus* Baker
 Family IRENIDAE
 329. *Aegithina tiphia tiphia* (Linnaeus)
 330. *Chloropsis hardwickii hardwickii* Jardine & Selby
 331. *Chloropsis cochinchinensis cochinchinensis* (Gmelin)
 332. *Irena puella puella* (Latham)
 Family PYCNONOTIDAE
 333. *Spizixos canifrons canifrons* (Blyth)
 334. *Pycnonotus atriceps atriceps* (Temminck)
 335. *Pycnonotus melanicterus flaviventris* (Tickell)
 336. *Pycnonotus jocosus emeria* (Linnaeus)
 337. *Pycnonotus cafer stanfordi* Deignan
 338. *Pycnonotus striatus striatus* (Blyth)
 339. *Pycnonotus flavescens flavescens* Blyth
 340. *Criniger flaveolus flaveolus* (Gould)
 341. *Hypsipetes viridescens cacharensis* (Deignan)
 342. *Hypsipetes mccllellandi mccllellandi* Horsfield
 343. *Hypsipetes flavalus flavalus* (Blyth)
 344. *Hypsipetes madagascariensis nigrescens* Baker
 Family MUSCICAPIDAE
 345. *Pellorneum ruficeps vocale* Deignan
 346. *Pellorneum albiventre albiventre* (Godwin-Austen)
 347. *Trichastoma tickelli assamensis* (Sharpe)
 348. *Trichastoma abbotti abbotti* (Blyth)
 349. *Pomatorhinus schisticeps schisticeps* Hodgson
 350. *Pomatorhinus ruficollis bakeri* Harington
 351. *Pomatorhinus erythrogenys mccllellandi* Godwin-Austen
 352. *Pomatorhinus ferruginosus formosus* Koelz
 353. *Pomatorhinus ochraceiceps austeni* Hume
 354. *Xiphirhynchus superciliaris intextus* Ripley
 355. *Rimator malacoptilus* Blyth
 356. *Napothera brevicaudata striata* (Blyth)
 357. *Napothera epilepidota roberti* (Godwin-Austen & Walden)
 358. *Spelaeornis longicaudatus* (Moore)
 359. *Spelaeornis chocolatinus chocolatinus* (Godwin-Austen & Walden)
 360. *Spelaeornis formosus* (Walden)
 361. *Sphenocichla humei roberti* Godwin-Austen & Walden
 362. *Stachyris ruficeps ambigua* (Harington)
 363. *Stachyris ruficeps ruficeps* Blyth
 364. *Stachyris chrysaea* Blyth
 365. *Macronous gularis rubricapilla* (Tickell)
 366. *Timalia pileata bengalensis* Godwin-Austen
 367. *Chrysomma sinense sinense* (Gmelin)
 368. *Paradoxornis nipalensis poliotis* (Blyth)
 369. *Paradoxornis ruficeps bakeri* (Hartert)
 370. *Paradoxornis gularis transfluvialis* (Hartert)
 371. *Turdoides longirostris* (Hodgson)
 372. *Turdoides striatus striatus* (Dumont)
 373. *Garrulax monileger monileger* (Hodgson)
 374. *Garrulax pectoralis melanotis* Blyth
 375. *Garrulax striatus cranbrooki* (Kinnear)
 376. *Garrulax leucolophus patkaicus* Reichenow
 377. *Garrulax chinenis nuchalis* Godwin-Austen
 378. *Garrulax galbanus galbanus* Godwin-Austen
 379. *Garrulax delesserti gularis* (McClelland)
 380. *Garrulax cineraceus cineraceus* (Godwin-Austen)
 381. *Garrulax caerulatus livingstoni* Ripley
 382. *Garrulax ruficollis* (Jardine & Selby)
 383. *Garrulax merulinus toxostominus* (Koelz)
 384. *Garrulax sannio albosuperciliaris* Godwin-Austen
 385. *Garrulax virgatus* (Godwin-Austen)
 386. *Garrulax austeni austeni* (Godwin-Austen)
 387. *Garrulax squamatus* (Gould)

388. *Garrulax erythrocephalus godwini* (Harington)
389. *Garrulax erythrocephalus erythrolaema* (Hume)
390. *Garrulax phoeniceus bakeri* (Hartert)
391. *Leiothrix argentauris vernayi* (Mayr & Greenway)
392. *Leiothrix lutea calipyga* (Hodgson)
393. *Cutia nipalensis nipalensis* Hodgson
394. *Pteruthius rufiventer* Blyth
395. *Pteruthius flaviscapis validirostris* Koelz
396. *Pteruthius melanotis melanotis* Hodgson
397. *Gampsorhynchus rufulus rufulus* Blyth
398. *Actinodura egertoni khasiana* Godwin-Austen
399. *Actinodura waldeni waldeni* Godwin-Austen
400. *Minla ignotincta ignotincta* Hodgson
401. *Minla strigula cinereigenae* (Ripley)
402. *Minla cyanouroptera cyanouroptera* (Hodgson)
403. *Yuhina castaniceps castaniceps* (Moore)
404. *Yuhina bakeri* Rothschild
405. *Yuhina flavicollis rouxi* (Oustalet)
406. *Yuhina gularis gularis* Hodgson
407. *Yuhina nigrimenta nigrimenta* Hodgson
408. *Yuhina xantholeuca xantholeuca* (Hodgson)
409. *Alcippe chrysotis albilineatus* (Koelz)
410. *Alcippe cinerea* (Blyth)
411. *Alcippe castaneiceps castaneiceps* (Hodgson)
412. *Alcippe vinipectus austeni* (Ogilvie-Grant)
413. *Alcippe cinereiceps manipurensis* (Ogilvie-Grant)
414. *Alcippe rufogularis collaris* Walden
415. *Alcippe brunnea mandelli* (Godwin-Austen)
416. *Alcippe poioicephalus fusca* Godwin-Austen
417. *Alcippe nipalensis nipalensis* (Hodgson)
418. *Alcippe nipalensis commoda* Ripley
419. *Heterophasia annectens annectens* (Blyth)
420. *Heterophasia gracilis* (McClelland)
421. *Heterophasia pulchella* (Godwin-Austen)
422. *Muscicapa muttui muttui* (Layard)
423. *Muscicapa ferruginea* (Hodgson)
424. *Muscicapa parva albicilla* Pallas
425. *Muscicapa strophciata strophciata* (Hodgson)
426. *Muscicapa monileger leucops* (Sharpe)
427. *Muscicapa hyperythra hyperythra* Blyth
428. *Muscicapa hodgsonii* (Verreaux)
429. *Muscicapa westermanni australorientis* Ripley
430. *Muscicapa superciliaris aestigma* G. R. Gray
431. *Muscicapa leucomelanura cerviniventris* (Sharpe)
432. *Muscicapa sapphira* (Blyth)
433. *Muscicapa grandis grandis* (Blyth)
434. *Muscicapa macgrigoriae signata* (Horsfield)
435. *Muscicapa sundara sundara* (Hodgson)
436. *Muscicapa vivida oatesi* (Salvadori)
437. *Muscicapa poliogenys cachariensis* (Madarasz)
438. *Muscicapa unicolor unicolor* (Blyth)
439. *Muscicapa rubeculoides rubeculoides* (Vigors)
440. *Muscicapa banyumas magnirostris* (Blyth)
441. *Muscicapa thalassina thalassina* Swainson
442. *Culicicapa ceylonensis calochrysea* Oberholser
443. *Rhipidura hypoxantha* Blyth
444. *Rhipidura albicollis stanleyi* Baker
445. *Terpsiphone paradisi saturatior* (Salomonsen)
446. *Hypothymis azurea styani* (Hartlaub)
447. *Tesia cyaniventer* Hodgson
448. *Tesia olivea* (McClelland)
449. *Cettia fortipes fortipes* (Hodgson)
450. *Cettia flavolivacea alexanderi* (Ripley)
451. *Cisticola exilis tytleri* Jerdon
452. *Cisticola juncidis cursitans* (Franklin)
453. *Prinia rufescens rufescens* Blyth
454. *Prinia hodgsonii rufula* Godwin-Austen

455. *Prinia subflava fusca* (Hodgson)
456. *Prinia socialis inglisi* Whistler & Kinnear
457. *Prinia flaviventris flaviventris* (Delessert)
458. *Prinia criniger catharia* Reichenow
459. *Prinia atrogularis khasiana* (Godwin-Austen)
460. *Graminicola bengalensis bengalensis* Jerdon
461. *Orthotomus sutorius luteus* Ripley
462. *Orthotomus atrogularis nitidus* Hume
463. *Orthotomus cucullatus coronatus* Blyth
464. *Megalurus palustris toklao* (Blyth)
465. *Acrocephalus orientalis* (Temminck & Schlegel)
466. *Acrocephalus bistrigiceps* Swinhoe
467. *Acrocephalus dumetorum* Blyth
468. *Phylloscopus affinis affinis* (Tickell)
469. *Phylloscopus fuscatus mariae* Ripley
470. *Phylloscopus pulcher pulcher* Blyth
471. *Phylloscopus inornatus mandellii* (Brooks)
472. *Phylloscopus inornatus inornatus* (Blyth)
473. *Phylloscopus proregulus newtoni* Gaetke
474. *Phylloscopus magnirostris* Blyth
475. *Phylloscopus occipitalis coronatus* (Temminck & Schlegel)
476. *Phylloscopus reguloides assamensis* Hartert
477. *Phylloscopus reguloides claudiae* (La Touche)
478. *Seicercus affinis* (Hodgson)
479. *Seicercus burkii burkii* (Burton)
480. *Seicercus xanthoschistos tephrodiras* Sick
481. *Seicercus poliogenys* (Blyth)
482. *Seicercus castaniceps castaniceps* (Hodgson)
483. *Abroscopus superciliaris flaviventris* (Jerdon)
484. *Abroscopus schisticeps flavimentalis* (Baker)
485. *Abroscopus albogularis albogularis* (Horsfield & Moore)
486. *Brachypteryx leucophrys nipalensis* Hodgson
487. *Brachypteryx montana cruralis* (Blyth)
488. *Erithacus calliope* (Pallas)
489. *Erithacus pectoralis confusus* (Hartert)
490. *Erithacus brunneus brunneus* (Hodgson)
491. *Erithacus cyane cyane* (Pallas)
492. *Erithacus chrysaeus chrysaeus* (Hodgson)
493. *Copsychus saularis erimelas* (Oberholser)
494. *Copsychus malabaricus indicus* (Baker)
495. *Phoenicurus ochruros rufiventris* (Vieillot)
496. *Phoenicurus hodgsoni* (Moore)
497. *Phoenicurus frontalis* (Vigors)
498. *Phoenicurus aureus leucopterus* (Blyth)
499. *Rhyacornis fuliginosus fuliginosus* (Vigors)
500. *Cinclidium leucurum* (Hodgson)
501. *Enicurus immaculatus* (Hodgson)
502. *Enicurus schistaceus* (Hodgson)
503. *Enicurus leschenaulti indicus* Hartert
504. *Enicurus maculatus guttatus* Gould
505. *Cochoa purpurea* Hodgson
506. *Cochoa viridis* Hodgson
507. *Saxicola leucura* (Blyth)
508. *Saxicola caprata burmanica* Baker
509. *Saxicola jerdoni* (Blyth)
510. *Saxicola ferrea* Gray
511. *Chaimarrornis leucocephalus* (Vigors)
512. *Monticola rufiventris* (Jardine & Selby)
513. *Myiophonus caeruleus temminckii* Vigors
514. *Zoothera sibirica sibirica* (Pallas)
515. *Zoothera citrina citrina* (Latham)
516. *Zoothera mollissima mollissima* (Blyth)
517. *Zoothera dixonii* (Seebohm)
518. *Zoothera dauma dauma* (Latham)
519. *Zoothera monticola monticola* Vigors
520. *Zoothera marginata* Blyth
521. *Turdus dissimilis dissimilis* Blyth
522. *Turdus albocinctus* Royle
523. *Turdus boulboul* (Latham)
524. *Turdus feai* (Salvadori)
525. *Turdus obscurus* Gmelin
526. *Turdus ruficollis atrogularis* Jarocki

527. *Turdus ruficollis ruficollis* Pallas

Family CINCLIDAE

528. *Cinctus pallasii dorjei* Kinnear

Family PARIDAE

529. *Melanochlora sultanea sultanea* (Hodgson)

530. *Parus major nipalensis* Hodgson

531. *Parus monticolus monticolus* Vigors

532. *Parus spilonotus subviridis* Blyth

533. *Sylviparus modestus modestus* Burton

534. *Aegithalos concinnus manipurensis* (Hume)

Family SITTIDAE

535. *Sitta europaea nagaensis* Godwin-Austen

536. *Sitta castanea cinnamoventris* Blyth

537. *Sitta himalayensis australis* Koelz

538. *Sitta formosa* Blyth

539. *Sitta frontalis frontalis* Swainson

Family CERTHIIDAE

540. *Certhia discolor manipurensis* Hume

Family MOTACILLIDAE

541. *Anthus hodgsoni hodgsoni* Richmond

542. *Anthus novaeseelandiae richardi* Vieillot

543. *Anthus novaeseelandiae rufulus* Vieillot

544. *Anthus cervinus* (Pallas)

545. *Anthus roseatus* Blyth

546. *Anthus spinoletta japonicus* Temminck & Schlegel

547. *Motacilla indica* Gmelin

548. *Motacilla cinerea cinerea* (Tunstall)

549. *Motacilla alba dukhunensis* Sykes

550. *Motacilla alba leucopsis* Gould

551. *Motacilla alba ocularis* Swinhoe

Family DICAEDAE

552. *Dicaeum agile agile* (Tickell)

553. *Dicaeum chrysorrheum chrysochlore* Blyth

554. *Dicaeum melanoxanthum* (Blyth)

555. *Dicaeum concolor olivaceum* Walden

556. *Dicaeum cruentatum cruentatum* (Linnaeus)

557. *Dicaeum ignipectus ignipectus* (Blyth)

Family NECTARINIIDAE

558. *Anthreptes singalensis rubinigentis* (Baker)

559. *Nectarinia sperata brasiliana* (Gmelin)

560. *Aethopyga gouldiae isolata* Baker

561. *Aethopyga gouldiae dabryi* (Verreaux)

562. *Aethopyga nipalensis koelzi* Ripley

563. *Aethopyga saturata assamensis*
(McClalland)

564. *Aethopyga siparaja labecula* (Horsfield)

565. *Aethopyga ignicauda ignicauda* (Hodgson)

566. *Arachnothera longirostris longirostris*
(Latham)

567. *Arachnothera magna magna* (Hodgson)

Family ZOSTEROPIDAE

568. *Zosterops palpebrosa palpebrosa*
(Temminck)

Family PLOCEIDAE

569. *Passer domesticus indicus* Jardine & Selby

570. *Passer montanus hepaticus* Ripley

571. *Passer rutilans intensior* Rothschild

572. *Ploceus benghalensis* (Linne)

573. *Lonchura striata acuticauda* (Hodgson)

574. *Lonchura punctulata subundulata* (Godwin-Austen)

575. *Lonchura malacca atricapilla* (Vieillot)

Family FRINGILLIDAE

576. *Mycerobas melanozanthos* (Hodgson)

577. *Carduelis spinoides heinrichi* Stresemann

578. *Carpodacus erythrurus roseatus* (Blyth)

579. *Pyrrhula subhimachala* (Hodgson)

580. *Pyrrhula nipalensis ricketti* La Touche

Family EMBERIZIDAE

581. *Emberiza rutila* Pallas

582. *Emberiza aureola aureola* Pallas

583. *Emberiza spodocephala sordida* Blyth

584. *Emberiza fucata fucata* Pallas

585. *Emberiza pusilla* Pallas

586. *Melophus lathami* (Gray)

Records of Game Birds Shot in Manipur State, 1910-1932									
	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	1917-18	
Geese									
Grey lag Geese	...	17	454	273	103	237	352	76	22
Bar-headed Geese	...	...	11	1	1	8	...	...	...
White-frened Geese	...	...	...	...	...	1	...	...	...
Total	17	465	274	104	245	353	76	22	
Ducks									
Pink-headed Duck	...	1	...	...	...	...	...	...	...
Cotton Teal	...	8	41	14	24	42	29	11	9
Lesser Whistling Teal	...	20	46	71	70	73	140	50	87
Common Shelrake	...	...	...	...	...	...	...	...	...
Ruddy Shedrake	...	1	6	4	1	4	6	7	9
Mallard	...	...	...	1	1	...	...	...	...
Sootbill	...	78	143	80	105	128	127	114	136
Testern Gry Duck	...	...	...	...	...	...	...	...	...
Bronze-capped Teal	...	...	...	1	...	1	3	1	1
Gadwall	...	22	41	141	68	100	339	186	85
Widgeon	—	1	2	9	8	18	44	19	44
Common Teal	...	29	76	191	175	231	504	482	364
Baikal Teal	...	...	...	1	...	...	1	...	...
Pintail	...	12	39	91	70	96	144	76	36
Garganey Teal	...	65	124	289	234	462	314	203	67
Shoviller	...	3	30	80	31	84	102	72	51
Red-crested Pochard	...	1	3	...	4	5	4	...	1
Common Pochard	...	4	32	100	155	104	295	139	31
White-eyed Pochard	—	10	46	96	73	93	153	97	74
Baer's Pochard	...	...	...	1	...	1	3	...	...
Scaup	...	...	...	...	...	...	...	...	...
Tufted Pochard	...	26	145	450	403	557	479	256	193
Golden-eyed Pochard	...	...	...	...	...	...	...	...	...
Hybrid Duck	...	...	...	...	...	1	...	...	...
Duck and Teal unclassified	...	...	...	...	...	58	59	101	...
Total	281	774	1619	1423	2060	2745	1819	1158	
Snipes									
Woodcock	...	...	1	...	1	1	13	3	...
Wood Snipe	...	6	1	1	...	5	3	20	3
Solitary Snipe	...	...	...	...	...	...	...	1	...
Fantail Snipe	...	23	671	582	715	910	890	1470	1076
Pintail Snipe	...	59	618	327	311	456	848	964	603
Jack Snipe	...	4	2	22	15	13	81	36	17
Painted snipe	...	2	21	41	59	45	80	103	22
Snipe, unclassified	...	1043	...	...	...	45	313	78	245
Total	1137	1314	973	1101	1475	2228	2675	1956	

		1918-19	1919-20	1920-21	1921-22	1922-23	1923-24	1924-25	1925-26
Ruddy Shedrake	...	1	...	2	...	4	2	3	11
Mallard	...	...	...	1	1	...	...	...	...
Sootbill	...	80	63	55	47	55	140	176	243
Testern Gry Duck	...	...	...	...	...	...	...	...	...
Bronze-capped Teal	...	2	4	...	3	2	3	7	6
Gadwall	...	62	104	204	354	500	548	760	440
Widgeon	—	11	11	9	21	25	40	111	38
Common Teal	...	316	273	181	113	236	376	896	1622
Baikal Teal	...	...	...	1	...	...	...	...	...
Pintail	...	39	39	4	28	94	51	35	183
Garganey Teal	...	91	70	133	132	98	375	560	466
Shoveller	...	39	32	37	44	63	50	136	191
Red-crested Pochard	...	3	9	1	3	72	3	8	...
Common Pochard	...	46	76	45	71	116	153	220	313
White-eyed Pochard	—	42	26	77	79	54	198	209	279
Baer's Pochard	...	2	...	1	...	...	1	5	12
Scaup	...	...	...	...	...	...	...	...	...
Tufted Pochard	...	169	79	296	256	324	365	299	707
Golden-eyed Pochard	...	...	...	...	...	...	...	...	...
Hybrid Duck	...	...	...	...	...	1	...	...	...
Duck and Teal unclassified	...	77	...	...	...	...	1	...	1
	Total	997	829	1096	1193	1665	2444	3611	4634
Snipes									
Woodcock	...	8	7	6	7	1	7	15	16
Wood Snipe	...	7	5	6	7	3	4	15	16
Solitary Snipe	...	...	...	...	...	...	...	1	...
Fantail Snipe	...	1052	936	857	690	664	555	1810	2752
Pintail Snipe	...	1281	615	493	808	490	904	1005	1526
Jack Snipe	...	12	49	23	1	8	9	6	33
Painted snipe	...	19	44	32	21	13	33	113	41
Snipe, unclassified	...	479	2	...	...	...	...	...	23
	Total	2681	1688	1417	1444	1179	1512	2964	4407
Plovers									
Golden Plover	...	20	67	46	26	34	83	73	22
Other Plover	...	...	...	...	1	...	1	1	...
	Total	20	67	40	27	34	84	74	22
Pheasants									
Burmese Peafowl	...	...	...	...	...	...	...	...	...
Jungle-fowl	...	...	23	4	...	4	15	52	41
Black-breasted Kalij	...	7	9	...	2	13	10	2	3
Assam Tragopan	...	...	...	...	...	...	...	...	...
	Total	7	32	4	2	17	25	54	44

		1918-19	1919-20	1920-21	1921-22	1922-23	1923-24	1924-25	1925-26
Partridges									
Assam Black Partridge	...	494	271	235	46	105	264	3	573
Chinese Francolin	...	3	...	3	2	3	...	2	...
Assam Bamboo Partridge	...	18	3	2	...	4	8	5	121
Hill Partridge	...	...	...	...	...	4	...	...	81
	Total	515	277	240	48	116	272	550	712
Qualls									
Grey Quail	...	10	3	11	1	2	3	3	7
Blue-breasted Quail	...	28	4	6	3	3	9	15	22
Manipur Bush-Quail	...	42	4	6	5	7	...	8	27
Burmese Bustard Quail	...	12	1	5	1	3	...	15	15
Little Button Quail	...	2	2	...	...	...	...	...	7
Burmese Button Quail	...	...	...	2	2	1	1	...	2
Quail, unclassified	...	...	...	...	...	...	...	...	...
	Total	94	14	30	12	16	13	41	83
Pigeons									
	...	...	17	...	...	...	7	...	8
Various and Big Game	...	...	...	3	3	1	5	10	3
Grand Total									
	...	4542	2966	2958	2834	3118	4483	7520	10094

		1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	TOTAL
Geese								
Grey lag Geese	...	101	161	140	45	280	174	3331
Bar-headed Geese	...	1	1	1	2	...	1	54
White-frened Geese	...	...	...	...	1	1	...	4
	Total	1092	162	141	48	281	175	3389
Ducks								
Pink-headed Duck	...	...	...	...	...	...	1	2
Cotton Teal	...	47	24	37	19	29	9	619
Lesser Whistling Teal	...	25	24	41	9	94	110	1262
Common Sheldrake	...	1	...	...	2	...	...	3
Ruddy Shedrake	...	7	5	2	3	8	3	89
Mallard	...	...	...	...	2	...	...	7
Sootbill	...	250	315	303	480	319	230	3667
Eastern Gry Duck	...	...	...	...	1	1	...	2
Bronze-capped Teal	...	4	8	5	6	4	3	63
Gadwall	...	...	361	494	437	475	115	6462
Widgeon	...	...	75	14	48	88	4	639
Common Teal	...	...	1276	2434	2013	1896	1101	15982
Baikal Teal	...	...	1	...	...	...	...	...
Pintail	...	134	464	402	970	268	206	3491
Garganey Teal	...	422	420	517	388	240	198	5869
Shoveller	...	140	313	362	265	289	177	2591
Red-crested Pochard	...	5	1	1	5	1	...	79

	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	TOTAL
Ducks (contd.)							
Common Pochard	... 330	293	231	201	298	298	3551
White-eyed Pochard	... 457	396	443	248	353	225	3728
Baer's Pochard	... 2	9	4	6	1	3	51
Scaup ...	... ..	1	...	...	...	...	2
Tufted Pochard	... 569	908	652	575	462	520	8690
Golden-eyed Pochard	... ..	...	...	...	...	...	1
Hybrid Duck	... ..	...	...	...	1	...	4
Duck and Teal unclassified	... 35	28	25	34	...	...	418
Total	4277	4921	5967	5712	4827	3213	57265
Snipes							
Woodcock	... 17	29	29	18	41	16	236
Wood Snipe	... 5	17	21	25	23	20	213
Solitary Snipe	... ..	...	...	1	1	...	3
Fantail Snipe	... 3457	3602	3028	2356	3168	2385	33558
Pintail Snipe	... 2377	1899	1482	1196	1922	2382	22599
Jack Snipe	... 21	69	57	16	27	22	543
Painted snipe	... 23	20	29	23	20	31	835
Snipe, unclassified	... 2	...	...	...	...	...	2226
Total	5900	5636	4646	3635	5202	4856	60216
Plovers							
Golden Plover	... 42	25	41	25	35	58	853
Other plover	... 1	...	...	...	...	...	37
Total	43	25	41	25	35	58	890
Pheasants							
Burmese Peafowl	... ..	1	...	...	...	...	1
Jungle-fowl	... 34	24	56	33	6	15	352
Black-breasted Kalij	... 15	11	11	8	13	7	132
Assam Tragopan	... ..	1	...	...	...	...	1
Total	49	37	67	41	19	22	486
Partridges							
Assam Black Partridge	... 172	397	315	322	335	390	5255
Chinese Francolin	... 1	6	11	1	...	...	48
Assam Bamboo Partridge	... 74	43	128	97	78	80	708
Hill Partridge	... 2	...	...	4	1	...	10
Total	149	446	454	420	413	470	6021
Qualls							
Grey Quail	... ..	5	...	7	...	...	80
Blue-breasted Quail	... 9	10	11	3	15	46	361
Manipur Bush-Quail	... 7	6	14	9	...	...	190
Burmese Bustard Quail	... 2	5	10	17	4	14	151
Little Button Quail	... ..	...	...	...	1	3	13
Burmese Button Quail	... 1	1	...	...	...	...	18
Quail, unclassified	... ..	...	...	8	...	...	11
Total	19	27	35	44	20	63	824
Pigeons							
Various and Big Game	... 1	...	5	...	...	...	83
	... 2	5	23	8	2	4	86
Grand Total	10642	11259	11379	9933	10799	88611	29260

ORNITHOLOGICAL ACCOUNTS

The numbers preceeding the names of the birds used in Ali And Ripley's Handbook of the birds of India and Pakistan, Vols. 1-10 (1968-1974).

Birds said to occur in Manipur from logical inference, such as from distributional point, and not based on recorded collection or reliable sight record, have their accounts given in square brackets.

Family PODICIPEDIDAE

3. *Podiceps cristatus cristatus* (Linnaeus) Great Crested Grebe

Winter visitor. May occur in winter in all types of water bodies.

5. *Podiceps ruficollis capensis* Salvadori Little grebe

A year-round resident bird in India. Fairly common in lakes and tanks.

26. *Phalacrocorax carbo sinensis* (Shaw) Large Cormorant

Resident. All India; on large bodies of water. May occur in large lakes in Manipur.

28. *Phalacrocorax niger* (Vieillot) Large Cormorant

Resident in India. Possibly breeds on suitable lakes (= Logtak).

29. *Anhinga rufa melanogaster* Pennant Darter

All India but sparse or not occur in NE India. Rarely occur in suitable water biotope.

Family ARDEIDAE

36. *Ardea cinerea rectirostris* Gould Eastern Grey Heron

Resident in India. A bird of marsh and wooded lakes. Slightly less common than purple Heron. Elsewhere breeds but returns early in Manipur (Higgins).

37. *Ardea purpurea manilensis* Meyen Eastern Purple Heron

A resident and also breeding in India. Fairly common, resides and breeds in Manipur (Higgins)

38. *Ardeola striatus chloriceps* (Bonaparte) Little Green Heron

Distributed in the entire Indian Union. Not uncommon, especially in hill streams where they debouch into the Manipur Valley (Roonwal).

42. *Ardeola grayii grayii* (Sykes) Indian Pond Heron

Common paddy field bird. All India. This species is common in Manipur both resident and breeding.

1 ♂, 1 ♀, 6 miles N. of Imphal, Ca. 2800', 4. 12. 1945 (Roonwal).

Measurements :	Wing	Tail	Bill
1 ♂	228	87	69
1 ♀	201	72	68

44. *Bubulcus ibis coromandus* (Boddaert) Cattle Egret

Common paddyfield bird. All India. Very common. 2 (Unsexed), Imphal Valley, Ca. 2,600/ 5.11.1945 (Roonwal).

Measurements :	Wing	Tail	Bill
2 (unsexed)	224-247	83-92	56-60

46. *Ardea alba modesta* J. E. Gray Large Egret

Common paddyfield bird. All India. Very common in Manipur Valley

47. *Egretta intermedia intermedia* (Wagler) Median Egret

Birds of field and marsh, found in the entire Union. Found in Manipur in suitable biotope.

49. *Egretta garzetta garzetta* (Linnaeus) Little Egret

Its distributional range includes Manipur.

52. *Nycticorax nycticorax nycticorax* (Linnaeus)
Night Heron

Its distributional range includes Manipur.

53. *Gorsachius melanolophus melanolophus*
(Raffles)
Malay or Tiger Bittern

A discontinuously distributed Indo-Malayan form having distributional in Manipur.

66. *Ixobrychus cinnamomeus* (Gmelin)
Chestnut Bittern

It is distributed throughout the Indian Union including Manipur.

67. *Ixobrychus sinensis* (Gmelin)
Yellow Bittern

Its distributional range includes Manipur.

58. *Ixobrychus flavicollis flavicollis* (Latham)
Black Bittern

Throughout Indian Union including Manipur.

60. *Mycteria leucocephala* (Pennant)
Painted Stork

Throughout the Indian Mainland including Manipur.

61. *Anastomus oscitans* (Boddaert)
Openbill Stork

Higgins reported it as very common, being seen in immense flocks and breeding.

62. *Ciconia episcopus episopus* (Boddaert)
Whitenecked Stork

The range of distribution of this bird include Manipur.

Family THRESKIORNITHIDAE

69. *Threskiornis aethiopica melanocephala*
(Latham)
White Ibis

Higgin reported it as not uncommon.

72. *Platalea leucorodia major* Temminck & Schlegel
Spoon bill

Throughout the Indian Mainland including Manipur.

Family ANATIDAE

79. *Anser albifrons albifrons* (Scopoli)
White fronted Goose

Higgins reported it as rare visitor and only been recorded four times, collected one on 25 Feb., 1916.

81. *Anser anser rubrirostris* Swinhoe
Eastern Grey Leg Goose

Higgins noted that first recorded shot in Manipur was on October 30th, 1911. Dumont noted large numbers in Loktak.

88. *Dendrocygna javanica* Horsfield
Lesser Whistling Teal

Higgins reported as resident and breeds in Manipur.

89. *Dendrocygna bicolor* (Vieillot)
Large Whistling Teal

Higgins reported this bird was very rare in Manipur. Noted a pair in September, 1925 and a single in October, 1929.

90. *Tadorna ferruginea* (Pallas)
Ruddy Shelduck

Higgins reported it as regular winter visitor but in small numbers.

91. *Tadorna tadorna* (Linnaeus)
Common Shelduck

Higgins reported it as rare visitor, collected two specimens between 1910-1927 and saw a flock of six in October, 1930.

93. *Ans acuta* Linnaeus
Pintail

Distributed throughout the Indian Union including Manipur.

94. *Anas crecca crecca* Linnaeus
Common Teal

Higgins reported it very common in all water bodies in Manipur.

95. *Anas formosa Georgi*
Baikal Teal

Very rare and sporadic winter visitor. Recorded from Manipur (Ripley 1961 : 31)

99. *Anas poecilorhyncha xenorhyncha*
Swinhoe
Eastern Grey Duck

Recorded from Manipur. Higgins commented it as very rare in Manipur. Only two recorded between 1930 and 1931.

101. *Anas strepera strepera* Linnaeus
Gadwal

An Wintering bird in India, gradually decreasing southwards. It has wintering range in Manipur.

102. *Anas falcata* Georgi
Falacated Teal

Straggler to India, recorded from Manipur (Ripley 1961 : 33).

103. *Anas penelope* Linnaeus
Wigeon

Winters throughout India including Manipur in suitable ponds and reedy swamps. Higgins reported it as common sporting bird in Manipur.

105. *Anas clypeata* Linnaeus
Shoveller

A common wintering species in India including Manipur.

108. *Aythya ferina* (Linnaeus)
Common Pochard

Common in India including Manipur. Higgins reported it as a good sporting bird.

109. *Aythya nyroca* (Guldenstadt)
White-eyed Pochard

Wintering in India including Manipur.

110. *Aythya baeri* (Radde)
Eastern White-eye

An uncommon wintering species, occasionally in Manipur (Ripley 1961 : 36).

111. *Aythya fuligula* (Linnaeus)
Tufted Duck

Winters in India including Manipur.

113. *Aix galericulata* (Linnaeus)
Mandarin Duck

Exceptional vagrant in Manipur.

114. *Nettapus coromandelianus*
coromandelianus (Gmelin)
Cotton Teal

Very common. Higgins reported it as resident and breeding bird.

116. *Cairina scutulata* (S. Muller)
White winged Wood Duck

Higgins reported it as very rare in Manipur. Occasionally in the S. E. of Manipur. Noted three in a small tributary of the Iril river on July 24, 1913 at about 3,000 ft.

117. *Bucephala clangula clangula* (Linnaeus)
Goldeneye Duck

A wintering vagrant in India, possibly in Manipur.

Family ACCIPITRIDAE

124. *Elanus caeruleus vociferus* (Latham)
Blackwinged Kite

Hume (1888) found it very common in the Imphal Valley and Kopum Thull and absent in the hills of Manipur. Roonwal & Nath (1948) also found it fairly common in Manipur.

Measurements :	Wing	Tail	Bill
1 ♂	273	123	23
1 (Unsexed)	279	131	21

128. *Aviceda leuphotes syama* (Hodgson)
Burmese Blackfested Baza

Sporadically distributed in NE India including Manipur.

131. *Pernis ptilorhynchos ruficollis* Lesson
Eastern Honey Buzzard

It has distributional range in Manipur.

133. *Milvus migrans govinda* Sykes
Pariah Kite

Hume (1888) found it common in Manipur. Roonwal & Nath (1948) found it common in Imphal Valley and noted upto 3,500 ft. Thin population are more frequently found in city and suburb than in the jungle.

Measurements :	Wing	Tail	Bill
♂	438	251	34
1 ♀	431	265	34

134. *Milvus migrans lineatus* (Gray)
Large Indian Kite

Hume (1888) Recorded uncommon in Manipur. Roonwal & Nath (1948) reported its occurrence in Imphal Valley.

This kite other than two preceeding races, is a forest type.

Measurements :	Wing	Tail	Bill
♂	497	333	36
1 ♀	431	281	27

135. *Haliastur indus indus* (Boddaert)
Brahminy Kite

Kanglatongbi, 16 miles N. of Imphal, Ca. 3,500 ft., 1 ♀ (2 Dec., 1945).

Measurements :	Wing	Tail	Bill
1 ♀	384	223	36

138. *Accipiter badius dussumieri* (Temminck)
Indian Shikra

It has distributional range in Manipur.

147. *Accipiter nusus nisosimilis* (Tickell)
Asiatic Sparrow-Hawk

Distributed in the Indian mainland including Manipur.

156. *Buteo buteo japonicus* (Temminck and Schlegel)
Buzzard

Distributed in the Indian mainland including Manipur.

158. *Spizaetus nipalensis nipalensis* (Hodgson)
Feathertoed Hawk-Eagle

Breeds in Manipur, from 2000-7000 ft. (Ripley 1961 : 50).

165. *Hieraaetus kienerii kienerii* (E. Geoffray)
Rufousbellied Hawk-Eagle

It has distributional range in Manipur.

170. *Aquila clanga* Pallas
Greater Spotted Eagle

Winters throughout India including Manipur.

171. *Aquila pomarina hastata* (Lesson)
Lesser Spotted Eagle

It has distributional range in Manipur.

178. *Sarcogyps calvus* (Scopoli)
Indian Black Vulture

It has distributional range in Manipur.

185. *Gyps bengalensis* (Gmelin)
Indian Whitebacked Vulture

Distributed in India including Manipur.

190. *Circus macrourus* (S. G. Gmelin)
Pale Harrier

A wintering bird in india including Manipur.

192. *Circus melanoleucos* (Pennart)
Pied Harrier

A winter visitant throughout India including Manipur.

193. *Circus aeruginosus aeruginosus* (Linnaeus)
Marsh Harrier

A wintering species of swamp in India including Manipur.

194. *Circus aeruginosus spilonotus* Kamp
Eastern Marsh Harrier

An eastern Asian winter migrant having distributional range in Manipur.

199. *Spilornis cheela burmanicus* Swann
Burmese Crested Serpent Eagle

It has distributional range in Manipur.

203. *Pandion haliaetus haliaetus* (Linnaeus)
Osprey

Wintering in India including Manipur.

Family FALCONIDAE

204. *Microhierax caerulescens caerulescens*
(Linnaeus)
Himalayan Redbreasted Falconet

Its distributional range includes Manipur.

205. *Microhierax melanoleucos* (Blyth)
Pied Pigmy Falcon

It has distributional range in Manipur.

208. *Falco biarmicus juggar* J. E. Gray
Laggar Falcon

Resident in India including Manipur.

209. *Falco peregrinus japonensis* Gmelin
Eastern Peregrine Falcon

A winter migrant in India including Manipur.

213. *Falco subbuteo centrasiaticae* (Buturlin)

It has distributional range in Manipur.

215. *Falco severus severus* Horsfield
Burmese Hobby

It has distributional range in Manipur.

220. *Falco vespertinus amurensis* Radde
Eastern Redlegged Falcon

Passage migrant sporadic records, Possibly in Manipur.

221. *Falco naumanni Fleischer*
Lesser Kestrel

Straggler in India, stray records, probably in Manipur.

223. *Falco tinnunculus interstinctus* McClelland
East Himalayan Kestrel

Imphal, 1 ♂ (3. 12. 1936). Imphal Valley, 3 ♀ (20, 26 Nov., 13 Dec., 1945). Kanglalongbi, N. of Imphal (c. 3,500') 1 ♂, All collected by Roonwal.

Hume (1888) found it common in the Imphal Valley and rare in the hills. Ronwal & Nath (1948) found it common in Manipur.

Measurements :	Wing	Tail	Bill
2 ♂	239-252	161-181	14-19
3 ♀	347-255	171-186	15-17

Family PHASIANIDAE

239. *Francolinus francolinus melanotus* Hume
Assam Black Partridge

Higgins reported this bird is very common in suitable localities.

243. *Fancolinns pintadeanus phayrei* (Blyth)
Burmese Francolin

Higgins remarked. It seems that this Francolin was never recorded as an inhabitant of Manipur in any scientific or semi scientific books or papers until 1914. Its distribution in the Manipur Valley appears to commence from the glen of the Khuga river (in the South West Corner of the valley), where it follows foothills in the southwest, south and east of the valley as far as pukhao in the glen of the Iril river in the extreme NE corner of the valley. It is nowhere so plentiful as the Black Partridge.

250. *Coturnix coturnix coturnix* (Linnaeus)
Grey Quail

Higgins reported it as rare in Manipur. The

earliest record in Manipur was shot on 3rd September, 1919.

252. *Coturnix coromandelica* (Gmelin)
Rain Quail

It has distributional range in Manipur.

253. *Coturnix chinensis chinensis* (Linnaeus)
Bluebreasted Quail

Baker remarked that this species is very common in Manipur.

265. *Perdica manipurensis manipurensis* Hume
Manipur Painted Bush Quail

Higgins noted it in the bogs and swamps in the south of the valley and also in the glens which run into it.

268. *Arborophila torqueola interstincta* Ripley
Assam Hill Partridge

It has distributional range in Manipur.

271. *Arborophila rufogularis intermedia* (Blyth)
Arakan Hill Partridge

It has distributional range in Manipur.

272. *Arborophila atrogularis* (Blyth)
Whitecheeked Hill Partridge

Imphal, Regailous camp (3,250 ft.) 1 ♂ 1 ♀ (9, 11, Feb., 1963) Hume (1888) found it very rare in Manipur and Higgins (1934) was on the same openion.

Measurements :	Wing	Tail	Bill
1 ♂	145	65	20
1 ♀	131	65	20

247. *Bambusicola fytchii hopkinsoni* Godwin-Austen
Assam Bamboo Partridge

Kanglatongbi, 18 miles N. of Imphal (c. 3,500 ft.) 3 ♂, 1 ♀ (10 Dec., 1945)

Hume (1888) noted it rare and obtained it in the eastern hills of Manipur.

Higgins (1934) found it common throughout the Manipur hills, upto 6,000 ft.

Roonwal & Nath (1948) noted it as thinly found in the Manipur hills.

Measurements :	Wing	Tail	Bill
3 ♂	138-150	100-115	20-24
1 ♀	141	103	23

288. *Tragopan blythii blythii* (Jerdon)
Greybellied Tragopan

Hume (1888) found only in thick forest in the higher ranges of both sides of the valleys.

Higgins (1934) reported that one was recorded on February 14th, 1928. But Col. Cassels shot two in 1894 and one in 1896.

296. *Lophura lencomelana lathamii* (J. E. Gray)
Blackbreasted Kallej

Nanglea Atrow, 63 miles W. of Imphal, (c. 3,250) Pheasant. 1 ♂ (13 Feb., 1936).

Bath Hume (1888) and Higgins (1934) found it common in Manipur, while Higgins also recorded *Williamsi* from Korong and Barak valley of Manipur.

Baker (1926) said this species as the common pheasant of Manipur.

Higgins (1934) further added that a quite number of birds on Thanga, a hilly island in Loktak.

Measurements :	Wing	Tail	Bill
1 ♂	256	295	33

297. *Lophura leucomelana williamsi* (Oates)
Williams' Kaleej Pheasant

Higgins (1934) saw the feathers of a male specimen shot in January, 1929 at Karong in the Barak Valley, 40 miles north of Imphal at about 3,500 ft.

Baker (1926) gave its habitat as east of the Manipur river, but all the localities he specified were in Burma, so presumably it was not recorded from so far north and west Manipur.

308. *Symaticus humiae humiae* (Hume)
Mrs Hume's Barredback Pheasant

Higgins (1934) saw this bird at Ukhrul in the eastern hills just below 6000 ft, for the first time during rain. For the second time in January, 1918 at Heika (4,700 ft.) in the Southern hills.

309. *Polyplectron bicalcaratum bakeri* Lowe
Peacock Pheasant

Ragailus camp (3,250 ft.) 1 ♂ (11 Feb., 1936). Hume (1888) recorded it as common in the western hills of Manipur, but absent in the valley and eastern hills. Higgins (1934) found it fairly common in the hills.

Measurements :	Wing	Tail	Bill
1 ♂	241	410	22

311. *Pavo cristatus* Linnaeus
Indian Peafowl

His Highness the Maharaja of Manipur had some pairs at the palace, the offspring of which ran wild over the country to some extent and reached the hills east and north of Imphal. Higgins (1934) was interested to see whether they were able to establish themselves and replace the extinct Burmese race by the Indians.

Family TURNICIDAE

313. *Turnix sylvatica dussumier* (Temminck)
Little Bustard Quail

This birds is not common, but occurs in suitable biotope.

315. *Turnix tanki blanfordii* Blyth
Burmese Yellowlegged Button Quail

It has distributional range in Manipur.

322. *Grus monacha* Temminck
Hooded Crane

Regular visitor, though not in large numbers. Col. Cassels recorded six having been shot on 31st December, 1897 and 1st January, 1898.

324. *Grus antigone sharpii* Blandford
Burmese Sarus

Not uncommon, residing and breeding in the swamps in the south of the valley, usually seen in pairs but Higgins once met with a large flock of 20 to 30 birds.

Family RALLIDAE

329. *Rallus striatus albiventer* Swainson
Indian Bluebreasted Banded Rail

It has distributional range in Manipur.

337. *Porzana pusilla pusilla* (Pallas)
Eastern Baillon's Crake

It winters in India including Manipur.

339. *Amaurornis fuscus bakeri* (Hatert)
Northern Ruddy Crake

It has distributional range in Manipur.

341. *Amaurornis bicolor* (Walden)
Elwes's Crake

It has distributional range in Manipur.

343. *Amaurornis phoenicurus chinensis*
(Boddaert)
Chinese Whitebreasted Waterhen

It has distributional range in Manipur.

346. *Gallicrex cinerea cinerea* (Gmelin)
Watercock

It is distributed in India including Manipur.

347. *Gallinula chloropus indica* Blyth
Indian Moorhen

It is distributed in India including Manipur.

349. *Porphyrio porphyrio poliocephalus* (Latham)
Indian Purple Moorhen

It has distributional range in Manipur.

350. *Fulica atra atra* Linnaeus
Coot

Higgins (1934) reported it very common winter

migrant. It comes with the Pochard but leaves before them.

Family JACANIDAE

358. *Hydrophasianus chirurgus* (Scopoli)
Pheasant-tailed Jacana

It has distributional range in Manipur.

359. *Metopidius indicus* (Latham)
Bronzewinged Jacana

It has distributional range in Manipur.

Family CHARADRIIDAE

364. *Vanellus vanellus* (Linnaeus)
Lapwing

Higgins (1934) reported it as very rare visitor. Five were shot on November 29th, 1916. Higgins saw two on the edge of the Loktak Lake on 26th December, 1920. Col. Goodall saw a large flock on a bill north of the Loktak on 13th January, 1930.

356. *Vanellus cinereus* (Blyth)
Greyheaded Lapwing

Higgins (1934) reported that this migratory species are almost invariably in flocks, sometimes as large as 50 birds on the wet ground round marshes and on the bills.

368. *Vanellus indicus atronuchalis* (Jerdon)
Burmese Redwattled Lapwing

Imphal Valley (c. 2,600 ft.) 1♂, 1♀ (25 November, 1945).

Hume (1888) found it rare in the basin and absent in the hills. Higgins (1934) also had the same view.

Measurements :	Wing	Tail	Bill
1♂	220	118	33
1♀	222	117	36

369. *Vanellus spinosus duvancelei* (Lesson)
Spurwinged Lapwing

This bird resides and breeds in Manipur.

373. *Pluvialis dominica fulva* (Gmelin)
Eastern Golden Plover

Higgins (1934) noted that it is found in flocks as large as 200 or 300 on grazing grounds, the edges of bills and in fallow paddy fields in migration time.

378. *Charadrius dubius curonicus* Gmelin
European Little Ringed Plover

It has distributional range in Manipur.

380. *Charadrius dubius jerdoni* (Legge)
Indian Little Ringed Plover

It has distributional range in Manipur.

381. *Charadrius alexandrinus alexandrinus*
Linnaeus
Kentish Plover

It has wintering range in Manipur.

384. *Charadrius mongolus atrifrons* Wagler
Pamirs Lesser Sand Plover

It has wintering range in Manipur.

386. *Numenius phaeopus variegatus* (Scopoli)
Eastern Whimbrel

Higgins (1934) reported a single bird was shot by Capt. Busfield on August 25th, 1932.

388. *Numenius arquata orientalis* C. L. Brehm
Eastern Curlew

A rare visitor, Higgins (1934) shot one out of a pair on 6th October, 1926 and Maj. E. R. Daboo, I. M. S. shot a single bird on September 10th, 1930. Higgins observed one on December 30th, 1925, another on 6th February, 1930.

392. *Tringa erythropus* (Pallas)
Spotted or Dusky Redshank

A regular visitor, seen in large flocks.

394. *Tringa totanus eurhinus* (Oberholser)
Eastern Redshank

It has distributional range in Manipur.

395. *Tringa stagnatilis* (Bechstein)
Marsh Sandpiper

It is wintering in India including Manipur.

396. *Tringa nebularia* (Gunnerus)
Greenshank

It is wintering in India including Manipur.

397. *Tringa ochropus* Linnaeus
Green Sandpiper

Imphal, 6 miles north (c. 2,800 ft.) 2 ♀ (4 December, 1945). Hume (1888) found it very common in Manipur.

Roonwal & Nath (1948) noted it distinctly uncommon and was occasionally seen near pools.

Measurements :	Wing	Tail	Bill
2 ♂	142-147	61-66	37-40

398. *Tringa glareda* Linnaeus
Spotted Sandpiper

It is wintering in Manipur.

401. *Tringa hypoleucos hypoleucos* Linnaeus
Common Sandpiper

It has distributional range in Manipur.

404. *Gallinago solitaria solitaria* Hodgson
Eastern Solitary Snipe

It is wintering in Manipur.

405. *Gallinago nemoricola* Hodgson
Woodsnipe

It has distributional range in Manipur.

406. *Gallinago stenura* (Bonaparte)
Pintail Snipe

It has distributional range in Manipur.

407. *Capela megala* (Swinhoe)
Swinhoe's Snipe

It has distributional range in Manipur.

409. *Gallinago gallinago gallinago* (Linnaeus)
Fantail Snipe

It has distributional range in Manipur.

410. *Gallinago minima* (Brunnich)
Jack Snipe

It has distributional range in Manipur.

411. *Scolopax rusticola rusticola* (Linnaeus)
Woodcock

It has distributional range in Manipur.

417. *Calidris temminckii* (Leisler)
Temminck's Stint

It has distributional range in Manipur.

426. *Philomachus pugnax* (Linnaeus)
Ruff

Uncommon, though not infrequent visitor.

Family ROSTRATULIDAE

429. *Rostratula benghalensis benghalensis*
(Linnaeus)
Painted Snipe

It has distributional range in Manipur.

Family RECURVIROSTRIDAE

430. *Himantopus himantopus himantopus*
(Linnaeus)
Indian Blackwinged Stilt

It is distributed in India including Manipur.

432. *Recurvirostra avosetta* Linnaeus
Avocet

Occasional visitor. Higgins (1934) once saw a pair (date not recorded).

Family BURHINIDAE

436. *Burhinus oedicephalus indicus* (Salvadori)
Indian Stone Curlew

Higgins (1934) shot only one specimen on 6th September, 1932.

437. *Esacus magnirostris recurvirostris* (Cuvier)
Great Stone Plover

Found in small parties.

Family LARIDAE

452. *Larus fuscus fuscus* Linnaeus
Lesser Blackbacked Gull

It has distributional range in Manipur.

454. *Larus brunnicephalus* Jerdon
Brownheaded Gull

Common in Lakes in the cold weather. Fond of associating with the Coots and Dabchicks.

463. *Sterna aurantia* J. E. Gray
India River Tern

It has distributional range in Manipur.

465. *Sterna hirundo tibetana* Saunders
Tibetan Common Tern

It has distributional range in Manipur.

470. *Sterna acuticauda* J. E. Gray
Blackbellied Tern

It has distributional range in Manipur.

Family COLUMBIDAE

493. *Treron apicauda apicauda* Blyth
Pintailed Green Pigeon

Higgins (1934) noted this species is not uncommon and has been shot in the hills.

494. *Treron sphenura sphenura* (Vigors)
Wedgetailed Green Pigeon

It has distributional range in Manipur but Higgins (1934) never saw or heard of this species in Manipur.

495. *Treron curvirostra nipalensis* (Hodgson)
Thickbilled Green Pigeon

This species is not uncommon in the hills.

Higgins (1934) saw a number of flocks in the jungle surrounding a village in the eastern hills at 4,200 ft. on 23rd March, 1918.

499. *Treron pompadora phayrei* (Blyth)
Ashyheaded Green Pigeon

Fairly common in the Hills.

Higgins (1934) shot a single bird on the west edge of the Manipur Valley on 5th February, 1915.

501. *Treron bicincta bicincta* (Jerdon)
Indian Orange breasted Green Pigeon

Mr. A. A. Barnard, J. S. E., saw a pair at Kanglatongbi, at the foot of the hills in the north of the valley in July, 1932 (Roonwal-1945).

503. *Treron phoenicoptera phoenicoptera* (Latham)
Bengal Green Pigeon

Higgins (1934) had no doubt their occurrence. Higgins shot them on several occasions in the Kabow valley, just across the Burma border where they are plentiful.

506. *Ducula aenea sylvatica* (Tickell)
Northern Green Imperial Pigeon

Higgins (1934) commented as, It does not occur in the Manipur valley and I have never seen it in the hills.

Roonwal & Nath (1945) noted it as common in the Kabow and Jiri valleys on the Burma and Cachar borders of the State, and also in the Nambar forest at the foot of the Naga Hills on the north.

516. *Ducula badia insignis* Hodgson
Nepal Maroonbacked Imperial Pigeon

It has distributional range in Manipur.

512. *Ducula badia griseicapilla* Walden
Greyheaded Imperial Pigeon

Hume (1888) found it common in Imphal Valley.

Higgins (1934) also found it common.

517. *Columba livia intermedia* Strickland
Indian Blue Rock Pigeon

Common and found elsewhere a domesticated species.

520. *Columba hodgsonii* Vigors
Speckled Wood Pigeon

It has distributional range in Manipur.

523. *Columba pulchricollis* Blyth
Ashy Wood Pigeon

Higgins (1934) saw three large grey pigeons on the upper slopes of the high range west of the Manipur Valley at 5,100 ft.

524. *Columba punicea* Blyth
Purple Wood Pigeon

It has distributional range in Manipur.

526. *Macropygia unchall tusalia* (Blyth)
Bartailed Cuckoo-Dove

Kanglatogbi, 16 miles N. of Imphal, (c. 3,500 ft.) 1 ♂ (20 December, 1945).

Hume (1888) found it in the Western hills but absent in the eastern hills of Manipur.

Higgins (1934) noted a single specimen in the Manipur Valley.

Measurements :	Wing	Tail	Bill
1 ♂	178	178	17

532. *Streptopelia orientalis agricola* (Tickell)
Eastern Turtle-Dove

Kanglatogbi, 16-18 miles N. of Imphal (c. 3,500 ft.) 2 ♂ (11 Dec., 1945).

Hume (1888) noted it as rare in the western hills and basin of Manipur and absent in the eastern hills.

Higgins (1934) found it very common in the Imphal Valley. Roonwal & Nath (1945) noted it as very common in Manipur.

Measurements :	Wing	Tail	Bill
2 ♂	175-185	123-137	23-25

534. *Streptopelia decaocto decaocto* (Frisvaldszky)
Indian Ring Dove

Kanglatongbi, 16 miles N. of Imphal (c. 3,500 ft.) 2 ♂ (13 Nov., 1945)

Hume (1888) found it very common in Manipur.

Roonwal & Nath (1948) noted it as less common.

Measurements :	Wing	Tail	Bill
2 ♂	170-174	131-136	17-18

536. *Streptopelia tranquebarica humilis*
(Temminck)
Burmese Red Turtle-Dove

These little doves are common in the Manipur Valley.

539. *Streptopelia chinensis tigrina* (Temminck)
Burmese Spotted Dove

Kanglatongbi, 15-16 miles N. of Imphal (c. 3,000 ft.) 2 ♂ (unsexed) (6, 14 Nov., 1945)

Hume (1888) found it common in Manipur but reported as s. c. suratensis.

Baker (1925) placed Manipur birds as intermediate between *suratensis* and *tigrina*.

Higgins (1934) found it common in Manipur.

Roonwal & Nath (1948) had the same observation.

Measurements :	Wing	Tail	Bill
2 ♂	138-145	136-144	17-18
1 (Unsexed)	143	143	17

542. *Chalcophaps indica indica* (Linnaeus)
Indian Emerald Dove

Higgins (1934) reported it as fairly common in the western hills.

Family PSITTACIDAE

547. *Psittacula eupatria avensis* (Kloss)
Large Burmese Parakeet

It has distributional range in Manipur.

549. *Psittacula krameri borealis* (Neumann)
Northern Roseringed Parakeet

Uchathol, 5 km. E. of Giribam, Imphal 1 ♀ (28 Nov., 1992) Common in Manipur Valley.

Measurements :	Wing	Tail	Bill
1 ♀	173	—	23

551. *Psittacula alexandri fasciata* (P. L. S. Muller)
Indian Redbreasted Parakeet

It is distributed in Manipur.

557. *Psittacula cyanocephala bengalensis*
(Forster)
Northern Blossomheaded Parakeet

It has distributional range in Manipur.

563. *Psittacula finschii* (Hume)
Eastern Slatyheaded Parakeet

It has distributional range in Manipur.

Family CUCULIDAE

569. *Clamator coromandus* (Linnaeus)
Redwinged Crested Cuckoo

It has winter migrant distributional range in Manipur.

570. *Clamator jacobinus serratus* (Sparrman)
Pied Crested Cuckoo

Its wintering range includes Manipur.

572. *Cuculus sparverioides sparverioides* Vigors
Large Hawk-Cuckoo

It is a winter migrant in Manipur.

573. *Cuculus varius varius* Vahl
Common Hawk-Cuckoo

It is wintering in Manipur.

575. *Cuculus fugax visicolor* Blyth
Hodgon's Hawk-Cuckoo

It has winter distributional range in Manipur.

579. *Cuculus canorus bakeri* Hartert
Khasi Hills Cuckoo

It has distributional range in Manipur.

581. *Cuculus poliocephalus poliocephalus*
Latham
Small Cuckoo

It has wintering range in Manipur.

585. *Cacomantis merulinus querulus* Heine
Rufousbellied Plaintive Cuckoo

It has wintering range in Manipur.

587. *Chalcites xanthorhynchus*
xanthorhynchus (Horsfield)
Violet Cuckoo

It has distributional range in Manipur.

588. *Surniculus lugubris dicruroides* (Hodgson)
Indian Drongo Cuckoo

It has distributional range in Manipur.

591. *Eudynamys scolopacea malayana*
Cabanis & Heine
Malay Koel

It has distributional range in Manipur.

593. *Rhopodytes tristis tristis* (Lesson)
Large Greenbilled Malkoha

It has distributional range in Manipur.

601. *Centropus sinensis intermedius* (Hume)
East Pakistan Crow-Pheasant

Karglatongbi, 16 miles N. of Imphal (c. 3,500 ft.) 1 (unsexed) (10 Nov., 1945).

Hume recorded it as common.

Measurements :	Wing	Tail	Bill
1 (unsexed)	197	238	36

605. *Centropus toulou bengalensis* (Gmelin)
Lesser Coucal

It has distributional range in Manipur.

Family STRIGIDAE

606. *Tyto alba stertens* Hartert
Indian Barn Owl

Imphal Valley (c. 2,500 ft.) 1 ♂ (14 Nov., 1945).

Hume (1888) found it rare in Manipur.

Roonwal & Nath (1948) collected only one in the jungle.

Measurements :	Wing	Tail	Bill
1 ♂	289	116	27

608. *Tyto capensis longimembris* (Jerdon)
Grass Owl

It has distributional range in Manipur.

609. *Phodilus badius saturatus* Robinson
Sikkim Bay Owl

It has distributional range in Manipur.

612. *Otus spilocephalus spilocephalus* (Blyth)
Eastern Spotted Scops Owl.

It has distributional range in Manipur.

616. *Otus scops sunia* (Hodgson)
North Indian Scops Owl.

Kanglatongbi, 16 miles N. of Imphal (c. 3,500 ft.)

Turibari, 5 km. W. of kangpokpi, Sonapati
2 ♂, 1 ♀ (8, 12 Nov., 1992)

Measurements :	Wing	Tail	Bill
2 ♂	146-144	64-62	19-18
2 ♀	154-152	69-71	19-20

624. *Otus bakkamoena lettia* (Hodgson)
Burmese Collared scops Owl

It has distributional range in Manipur.

627. *Bubo bubo bengalensis* (Franklin)
Indian Great Horned Owl

It has distributional range in Manipur.

628. *Bubo nipalensis nipalensis* (Hodgson)
Forest Eagle Owl

It has distributional range in Manipur.

630. *Bubo coromandus coromandus* (Latham)
Dusky Horned Owl

It has distributional range in Manipur.

631. *Bubo zeylonensis leschenault* (Temminck)
Brown Fish Owl

It has distributional range in Manipur.

633. *Bubo flavipes* (Hodgson)
Twany Fish Owl

It has distributional range in Manipur.

635. *Glaucidium brodiei brodiei* (Buston)
Collared Pigmy Owlet

It has distributional range in Manipur.

641. *Glaucidium cuculoides rufescens* Baker
Burmese Barred Owlet

Nanglea Atrow, 60 miles from Imphal (c. 3,250 ft.) 1 ♂ Hume (1888) found it very common in the Western hills but absent in the basin and other hills.

Measurements :	Wing	Tail	Bill
1 ♂	150	101	18

643. *Ninox scutulata burmanica* Hume
Burmese Brown Hawk Owl

It has distributional range in Manipur.

650. *Athene brama indica* (Franklin)
Northern Spotted Owlet

It has distributional range in Manipur.

658. *Strix leptogrammica newarensis* (Hodgson)
Himalayan Brown Wood Owl

Modbung Kanglatongbi, 16 miles N. of Imphal
3 ♀ (23 Nov., 6, 13 Dec., 1945).

Hume (1888) found it in Manipur.

Measurements :	Wing	Tail	Bill
3 ♂	372-385	223-238	39-42

662. *Strix aluco nivicola* (Blyth)
Himalayan Wood Owl

It has distributional range in Manipur.

664. *Asio flammeus flammeus* (Pontoppidan)
Shorteared Owl

It has distributional range in Manipur.

Family CAPRIMULGIDAE

667. *Batrachostomus hodgsoni* (G. E. Gray)
Hodgson's Frogmouth

It has distributional range in Manipur.

668. *Eurostopodus macrotis cerviniceps* (Gould)
Burmese Great Eared Nightjar

It has distributional range in Manipur.

670. *Caprimulgus indicus hazarae* Whistler &
Kinnear**Himalayan Jungle Nightjar**

It has distributional range in Manipur.

678. *Caprimulgus macrurus ambiguus* Hartert
Indian Longtailed Nightjar

It is distributed in Manipur.

682. *Caprimulgus affinis monticola* Franklin
Franklin's Nightjar

It has distributional range in Manipur.

Family APODIDAE

683. *Collocalia brevirostris brevirostris*
(Horsfield)**Himalayan Swiftlet**

It has distributional range in Manipur.

690. *Chaetura (Caudacuta) cochinchinensis*
Oustalet**Cochichina Spinetail Swift**

It has distributional range in Manipur.

691. *Chaetura gigantea indica* Hume
Brownthroated Spinetail Swift

It has distributional range in Manipur.

699. *Apus pacificus pacificus* (Latham)
Large Whiterumped Swift

It has distributional range in Manipur.

700. *Apus pacificus leuconyx* (Blyth)
Himalayan Whiterumped Swift

It has distributional range in Manipur.

706. *Apus affinis subfurcatus* (Blyth)
Malay House Swift

It has distributional range in Manipur.

708. *Cypsiurus parvus infumatus* Solater
Eastern Palm Swift

It is distributional in Manipur.

709. *Hemiprocne longipennis coronata* (Tickell)
Crested Tree Swift

It has distributional range in Manipur.

Family TROGONIDAE

713. *Harpactes erythrocephalus hodgsonii*
(Gould)**Nepal Redheaded Trogon**

It has distributional range in Manipur.

714. *Harpactes erythrocephalus helenae*
Mayr**Mishmi Redheaded Trogon**

It has distributional range in Manipur.

715. *Harpactes erythrocephalus*
erythrocephalus (Gould)**East Pakistan Redheaded Trogon**

Luanglong Khunow (c. 3,250 ft.) 1 ♂ (9 Feb., 1936)

Hume (1888) found it common in Manipur.

Measurements :	Wing	Tail	Bill
1 ♂	149	187	20

Family ALCEDINIDAE

718. *Ceryle lugubris guttulata* Stejneger
East Himalayan Pied Kingfisher

It is distributed in Manipur.

719. *Ceryle rudis leucomelanura* Reichenbach
Indian Pied Kingfisher

Imphal Valley (c. 2,600 ft.) 1 ♀ (29 Nov., 1945).

Hume (1888) found it very rare in the Imphal Valley and entirely absent in the hills.

Roonwal & Nath (1948) found it common.

This species is very rare. Usually with patchy distribution with thin population. One-two birds are observed flying through outskirts of the forest. Easily recognised by its loud call during flight.

Measurements :	Wing	Tail	Bill
1 ♀	137	80	63

721. *Alcedo hercules* Laubmann
Great Blue Kingfisher

It has distributional range in Manipur.

723. *Alcedo atthis bengalensis* Gmelin
Indian Small blue Kingfisher

10 miles N. of Imphal (c. 2,800 ft.) 1 ♀ (3 Dec., 1945). Jiribam, Manipur 1 ♂, 1 ♀ (19 Mar., 1992).

Measurements :	Wing	Tail	Bill
1 ♂	68	35	44
3 ♀	71, (3)	35(2), 34	42(2), 43

725. *Alcedo meninting coltarti* Baker
Assam Blue-eared Kingfisher

It has distributional range in Manipur.

727. *Ceyx erithacus erithacus* (Linnaeus)
Indian Threetoed Forest Kingfisher

It has distributional range in Manipur.

730. *Pelargopsis capensis capensis* (Linnaeus)
Brownheaded Storkbilled Kingfisher

It has distributional range in Manipur.

733. *Halcyon coromanda coromanda* (Latham)
Indian Ruddy Kingfisher

It has distributional range in Manipur.

737. *Halcyon smyrnensis perpulchra* Madarasz
Eastern Whitebreasted Kingfisher

It is distributed in Manipur.

739. *Halcyon pileata* (Boddaert)
Blackcapped Kingfisher

It has distributional range in Manipur.

Family MEROPIDAE

744. *Merops leschenaulti leschenaulti* Vieillot
Chestnut headed Bee-eater

It has distributional range in Manipur.

753. *Nyctyornis athertoni athertoni*
(Jardine & Selby)
Bluebearded Bee-eater

It has distributional range in Manipur.

Family CORACIDAE

757. *Coracias benghalensis affinis* Horsfield
Burmese Roller

Kanglatongbi, 16 miles N. of Imphal 1 ♂, 1 ♀ (26 Nov., 1945).

Hume (1888) observed it absent both in the hills and rare in the basin.

Roonwal (1948) found it common in the Imphal Valley and upto 3,500 ft.

Measurements :	Wing	Tail	Bill
1 ♂	183	132	37
1 ♀	130	130	40

758. *Eurystomus orientalis cyanicollis* Vieillot
Himalayan Broadbilled Roller

It has distributional range in Manipur.

Family UPUPIDAE

766. *Upupa epops longirostris* Jerdon
Burmese Hoopoe

Kanglatongbi, 18 miles N. of Imphal (c. 3,500 ft.) 1 ♂ (22 Dec., 1945).

Measurements :	Wing	Tail	Bill
1 ♂	148	110	65

Family BUCEROTIDAE

771. *Aceros nipalensis* (Hodgson)
Rufousnecked Hornbill

It has distributional range in Manipur.

772. *Rhyticeros undulatus ticehursti* Deignan
Assam Wreathed Hornbill.

It has distributional range in Manipur.

774. *Anthracoceros malabaricus malabaricus*
(Gmelin)

Indian Pied Hornbill

Naglea Atrow, 63 miles from Imphal (c. 3,250 ft.) 1 ♀ (13 Feb., 1936).

Hume (1888) found it common in the western hills of Manipur but absent in the eastern hills.

Present population is absolutely thin. Survive only in some evergreen forest patch due to continuous killing by local people and hunter for its long quill feathers, enormous bill and flesh.

Measurements :	Wing	Tail	Bill
1 ♀	294	273	142

776. *Buceros bicornis homrai* Hodgson
Great Pied Hornbill

It has distributional range in Manipur.

Family CAPITONIDAE

778. *Megalaima virens magnifica* Baker
Assam Great Barbet

It has distributional range in Manipur.

784. *Megalaima lineata hodgsoni* Bonaparte
Eastern Lineated Barbet

It has distributional range in Manipur.

787. *Megalaima franklini franklini* (Blyth)
Golden Throated Barbet

It has distributional range in Manipur.

788. *Megalaima asiatica asiatica* (Latham)
Bluethroated Barbet

Ragailous camp Imphal 1 ♂ (11 Nov., 1936)

Measurements :	Wing	Tail	Bill
1 ♂	105	69	25

789. *Megalaima australis cyanotis* (Blyth)
Indian Blue-eared Barbet

It has distributional range in Manipur.

792. *Megalaima haemacephala indica* (Latham)
Copper Smith.

It has distributional range in Manipur.

Family PICIDAE

795. *Indicator xanthonotus fulvus* Ripley
Nagaland Orange rumped Honeyguide

It has distributional range in Manipur.

797. *Jynx torquilla chinensis* Hesse
Chinese Wryneck

Uchathol, Jiribam, Imphal 1 ♀ (28 Nov., 1992).

Measurements :	Wing	Tail	Bill
1 ♀	82	87	17

799. *Picumnus innominatus malayorum* Hartert
Southern Speckled Piculet

It has distributional range in Manipur.

801. *Sasia ochracea reichenowi* Hesse
Burmese Rufous Piculet

It has distributional range in Manipur.

803. *Micropternus brachyurus phaiiceps*
Blyth
Eastern Rufous Woodpecker

It has distributional range in Manipur.

810. *Picus canus gyldenstolpei* Baker
Assam Blacknaped Green Woodpecker

It has distributed in Manipur.

813. *Picus flavinucha flavinucha* Gould
Eastern Large Yellownaped Woodpecker

It has distributional range in Manipur.

815. *Picus chlorolophus chlorolophus* Vieillot
East Himalayan Yellownaped Woodpecker

It has distributional range in Manipur.

819. *Dinopium benghalense benghalense*
(Linnaeus)
Northern Goldenbacked Woodpecker

It has distributional range in Manipur.

824. *Dinopium shorii shorii* (Vigors)
Himalayan Goldenbacked Threetoed Woodpecker

It has distributional range in Manipur.

826. *Dinopium javanense intermedium* (Blyth)
Burmese Goldenbacked Threetoed Woodpecker

It has distributional range in Manipur.

827. *Gecinulus grantia grantia* (Horsfield)
Paleheaded Woodpecker

It has distributional range in Manipur.

829. *Mulleripicus pulverulentus harterti* Hesse
Assam Great Slaty Woodpecker

It is distributed in Manipur.

833. *Hypopicus hyperythrus hyperythrus*
(Vigors.)
Eastern Rufousbellied Woodpecker

It is distributed in Manipur.

834. *Picoides major stresemanni* (Rensch)
Blackcrowned Pied Woodpecker

It is distributed in Manipur.

838. *Picoides darjellensis* (Blyth)
Darjeeling Pied Woodpecker

It has distributional range in Manipur.

841. *Picoides cathpharius pyrrhothorax*
(Hume)

Manipur Crimsonbreasted Pied Woodpecker

This is described from Aimoles, eastern

Manipur Hills and also reported from Meghalaya (Ripley, 1982).

844. *Picoides atratus* (Blyth)
Stripebreasted Pied Woodpecker

Manipur (c. 2,600 ft.) 1 ♀ (4 Feb., 1936).

Hume (1888) reported it as rare and found only in the eastern hills.

Measurement :	Wing	Tail	Bill
1 ♀	110	71	21

845. *Picoides macei macei* (Vieillot)
Fulvousbreasted Pied Woodpecker

It has distributional range in Manipur.

850. *Picoides canicapillus canicapillus*
(Blyth)

Burmese Greycrowned Pygmy Woodpecker

It has distributional range in Manipur.

856. *Hemicircus canente canente* (Lesson)
Heartspotted Woodpecker

It is distributed in Manipur.

857. *Blythipicus pyrrhotis pyrrhotis* (Hodgson)
Redeared Baywoodpecker

It has distributional range in Manipur.

861. *Chrysocolaptes lucidus guttacristatus*
(Tickell)
Eastern Larger Goldenbacked Woodpecker

It has distributional range in Manipur.

Order PASSERIFORMES

Family EURYLAIMIDAE

864. *Serilophus lunatus rubropygius* (Hodgson)
Nepal Collared Broadbill

It has distributional range in Manipur.

865. *Psarisomus dalhousiae dalhousiae*
(Jameson)

Longtailed Broadbill

Nanglea Atrow, 63 miles from Imphal 1 ♂, 1 ♀ (13 Feb., 1936).

Hume (1888) found it common in the hills but not in Valley.

Measurements :	Wing	Tail	Bill
1 ♂	102	124	18
1 ♀	100	112	19

Family PITTIDAE

866. *Pitta nipalensis nipalensis* (Hodgson)

Bluenaped Pitta

It is distributed in Manipur.

867. *Pitta brachyura brachyura* (Linnaeus)

Indian Pitta

It is distributed in all India including Manipur.

869. *Pitta sordida cucullata* Hartlaub

Greenbreasted Pitta

It has distributional range in Manipur.

871. *Pitta cyanea cyanea* Blyth

Blue Pitta

Its distributional range includes Manipur.

Family ALAUDIDAE

873. *Mirafra assamica assamica* Horsfield

Bengal Bush Lark

It is distributed in Manipur.

878. *Eremopterix grisea* (Scopoli)

Ashycrowned Finch-Lark

It is distributed in Manipur.

Family HIRUNDINIDAE

911. *Riparia riparia ijimae* (Lonnberg)

Eastern Collared Sand Martin

It has distributional range in Manipur.

918. *Hirundo rustica tyleri* Jerdon

Chestnutbellied Swallow

It has winter distributional range in Manipur.

929. *Hirundo striolata mayri* Hall
Chinese Striated or Redrumped Swallow

It is wintering in Manipur.

932. *Delichon nipalensis nipalensis* Moore

Nepal House Martin

It has distributional range in Manipur.

Family LANIIDAE

938. *Lanius collurioides* Lesson

Chestnutrumped Shrike

It is distributed in Manipur.

945. *Lanius tephronotus tephronotus* (Vigors)

Eastern Tibet Greybacked Shrike

It has distributional range in Manipur.

948. *Lanius schach tricolor* (Hodgson)

Imphal (c. 3,500 ft.) 1 ♂ 1 ♀ (24 Nov., 1945).

Hume (1888) found it common in Manipur.

Roonwal & Nath (1948) had the same view.

Measurements :	Wing	Tail	Bill
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1 ♂	96	12	—
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1 ♀	98	121	15
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949. *Lanius cristatus cristatus* Linnaeus

Brown Shrike

Imphal Valley (c. 2,500 ft.) 1 ♂ (3 Dec., 1945).

Hume (1888) found it fairly common in Manipur.

Roonwal & Nath (1948) noted it less common than earlier race.

Measurements :	Wing	Tail	Bill
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1 ♂	90	86	16
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Family ORIOLIDAE

955. *Oriolus chinensis tenuirostris* Blyth

Slenderbilled Blacknaped Oriole

It has distributional range in Manipur.

958. *Oriolus xanthornus xanthornus* (Linnaeus)
North Indian Blackheaded Oriole

It is fairly common and noted elsewhere in Manipur.

961. *Oriolus traillii traillii* (Vigors)
Indian Maroon Oriole

Luanglong Khulem 1, Jun., 1 (9 Feb., 1936)

Oates (1889) extended its range upto Manipur.

Measurements :	Wing	Tail	Bill
1 Jun. ♂	171	109	28

Family DICRURIDAE

962. *Dicrurus adsimilis albiricuts* (Hodgson)
North Indian Black Drongo

It has distributional range in Manipur.

966. *Dicrurus leucophaeus hopwoodi* Baker
Assam Grey Drongo

Kanglatongbi 16 miles N. of Imphal (c. 3,500 ft.) 1 ♂ (29 Dec., 1945).

Hume (1888) found it in the hills but absent in the Imphal basin.

Measurements :	Wing	Tail	Bill
1 ♂	140	147	25

967. *Dicrurus caerulescens caerulescens* (Linnaeus)
Indian White bellied Drongo

It is distributed in Indian mainland including Manipur.

970. *Dicrurus annectans* (Hodgson)
Crowbilled Drongo

It has distributional range in Manipur.

971. *Dicrurus aeneus aeneus* Vieillot
Bronzed Drongo

Chandal, Manipur 1 ♂ 1 ♀ (9 Mar., 1992).

Measurements :	Wing	Tail	Bill
1 ♂, 1 ♀	124, 117	113	22, 21

972. *Dicrurus remifer tectirostris* (Hodgson)
Lesser Racket-tailed Drongo

It has distributional range in Manipur.

973. *Dicrurus hottentottus hottentottus* (Linnaeus)
Haircrested Drongo

It has distributional range in Manipur.

976. *Dicrurus paradiseus grandis* (Gould)
Greater Racket-tailed Drongo

It has distributional range in Manipur.

Family ARTAMIDAE

982. *Artamus fuscus* Vieillot
Ashy Swallow-Shrike

It is distributed in Indian mainland including Manipur.

Family STURNIDAE

984. *Saroglossa spiloptera* (Vigors)
Spottedwinged Stare

It has distributional range in Manipur.

985. *Aplonis panayensis affinis* (Blyth)
Tipperah Glossy Stare

It has distributional range in Manipur.

989. *Sturnus malabaricus nemoricola* (Jerdon)
Whitewinged Myna

It has distributional range in Manipur.

1004. *Sturnus contra superciliaris* (Blyth)
Burmese Pied Myna.

Imphal (c. 2,800 – 3,000 ft.) 2 ♂, 1 ♀.

Uchathal, Jiribam, Imphal 1 ♂, 4 ♀ (29 Nov., 1992).

Hume (1888) found it fairly common in the Manipur Valley and absent in the hills.

Roonwal & Nath (1948) also found it common in the valley and found upto 3,500 ft.

Measurements :	Wing	Tail	Bill
3 ♂	118-120	65-72	31-33
5 ♀	113-115	67-72	29-33

1005. *Sturnus sinensis* (Gmelin)
Chinese or Grey backed Myna

It has distributional range in Manipur.

1006. *Acridotheres tristis tristis* (Linnaeus)
Indian Myna

10 miles N. of Imphal (c. 3,000 ft.) 3 ♂, 1 ♀
(9 Dec., 1945).

Roonwal & Nath (1948) found it upto 3,500 ft.

Measurements :	Wing	Tail	Bill
3 ♂	140-144	91-95	22-25
1 ♀	136	87	24

1009. *Acridotheres fuscus fuscus* (Wagler)
Northern Jungle Myna

It has distributional range in Manipur.

1012. *Acridotheres javanicus infuscatus*
(Baker)

Orangebilled Jungle Myna

Kanglatongbi 15 miles N. of Imphal (c. 3,500 ft.) 3 ♂ (14 Dec., 1945).

Hume (1888) noted only in South and Southeast Manipur and found rare everywhere.

Roonwal & Nath (1948) found it common.

Measurements :	Wing	Tail	Bill
3 ♂	133-137	83-100	22-25

1013. *Acridotheres albocinctus* Godwin-
Austen & Walden
Collared Myna

Kanglatongbi, 18 miles N. of Imphal (c., 3,500 ft.) 1 ♀ (22 Dec., 1945).

Godwin-Austen & Walden (1875) found it common in Manipur Valley. Hume (1888) had the same view.

Measurements :	Wing	Tail	Bill
1 ♀	125	76	25

1014. *Mino coronatus* (Blyth)
Goldcrested Myna

It has distributional range in Manipur.

1015. *Gracula religiosa intermedia* A. Hay
Northern Hill Myna

It has distributional range in Manipur.

Family CORVIDAE

1021. *Garrulus glandarius interstinctus* Hartert
East Himalayan Redcrowned Jay

It has distributional range in Manipur.

1023. *Cissa chinensis chinensis* Boddaert
Green Magpie

It has distributional range in Manipur.

1028. *Cissa erythrorhyncha magnirostris*
(Blyth)
Burmese Redbilled Blue Magpie

Kanglatongbi, 18 miles N. of Imphal (c. 3,500 ft.) 1 ♂ (22 Dec., 1945).

Hume (1888) noted it in Manipur.

Roonwal & Nath (1948) found it common in the jungle of Dimapur Road, Imphal. Relatively less in population than North eastern Treepie in dense forest.

Measurements :	Wing	Tail	Bill
1 ♂	194	446	36

1032. *Dendrocitta vagabunda vagabunda*
(Latham)
Northeastern Tree Pie

It is distributed in Manipur.

1035. *Dendrocitta frontalis frontalis* Horsfield
Blackbrowed Tree Tie

It has distributional range in Manipur.

1038. *Dendrocitta formosae himalayana* Jerdon
East Himalayan Tree Tie

Tairenpokpi (c. 3,000 ft.) 1 ♀ (7 Feb., 1936).

Hume (1888) found it in both western and eastern hills of Manipur.

Measurements :	Wing	Tail	Bill
1 ♀	144	208	30

1049. *Corvus splendens splendens* Vieillot
Indian House Crow

It has distributional range in Manipur.

1055. *Corvus macrorhynchos levaillartii* Lesson
Eastern Jungle Crow

It is distributed in Manipur.

Family CAMPEPHAGIDAE

1064. *Hemipus picatus picatus* (Sykes)
Blackbacked Pied Flycatcher Shrike

It has distributional range in Manipur.

1067. *Tephrodornis virgatus pelvica* (Hodgson)
Nepal Wood Shrike

It has distributional range in Manipur.

1079. *Coracina melanoptera sykesi*
(Strickland)
Peninsular Blackheaded Cuckoo-Shrike

It is distributed in Manipur.

1084. *Pericrocotus brevirostris brevirostris*
(Vigors)
Shortbilled Minivet

It has distributional range in Manipur.

1087. *Pericrocotus ethologus mariae* Ripely
Nagaland Longtailed Minivet.

It has distributional range in Manipur.

1088. *Pericrocotus solaris solaris* Blyth
Yellowthroated Minivet

It has distributional range in Manipur.

1089. *Pericrocotus roseus roseus* (Vieillot)
Rosy Minivet

It has distributional range in Manipur.

1095. *Pericrocotus cinnamomeus viridus* Baker
Eastern Small Minivet

It is distributed in Manipur.

Family IRENIDAE

1098. *Aegithina tiphia tiphia* (Linnaeus)
Common Iora

It has distributional range in Manipur.

1106. *Chloropsis hardwickii hardwickii* Jardine
& Selby
Orangebellied Chloropsis

Regailous camp, Manipur (c. 3,250 ft.) 1 ♀.

Hume (1888) noted it common in many parts of Manipur.

Measurements :	Wing	Tail	Bill
1 ♀	87	72	20

1108. *Chloropsis cochinchinensis cochinchinensis* (Gmelin)
Goldmantled Chloropsis

It has distributional range in Manipur.

1110. *Irena puella puella* (Latham)
Fairy Bluebird

Nanglea Atrow, 63 miles from Imphal, 1 ♀ (9 Feb., 1936).

Hume (1888) found it very common in some forested parts of Manipur.

It is a disjunct distributed species.

Measurements :	Wing	Tail	Bill
1 ♀	136	119	23

Family PYCNONOTIDAE

1111. *Spizixos canifrons canifrons* Blyth
Finchbilled Bulbul

Kalanaga (c. 3,250 ft.) 1 ♂ (16 Feb., 1936).

Hume (1888) reported it from western hills and rare in elsewhere of Manipur.

Measurements :	Wing	Tail	Bill
1 ♂	95	98	15

1112. *Pycnonotus atriceps atriceps* (Temminck)
Blackheaded Bulbul

Manglea Atrow (c. 3,250 ft.) 1 ♂ (14 Feb., 1936).

Baker (1922) extended its range upto Manipur.

Measurements :	Wing	Tail	Bill
1 ♂	85	81	16

1115. *Pycnonotus melanicterus flaviventris* (Tickell)
Blackcrested Yellow Bulbul

Luanglong Khulen (c. 3,250 ft.) 1 ♂ (9 Feb., 1936).

Kalanaga (c. 3,250 ft.) 1 ♂, 1 ♀ (16 Feb., 1936).

Hume (1888) found it common in the western hills but absent in Manipur Valley and the eastern hills.

Measurements :	Wing	Tail	Bill
2 ♂	92	91-97	13-14
1 ♀	83	82	15

1121. *Pycnonotus jocosus emeria* (Linnaeus)
Bengal Redwhiskered Bulbul

Turibari, Kangpokpi, Senapati 2 ♂, 2 ♀ (8 Nov., 1992).

Measurements :	Wing	Tail	Bill
2 ♂	90-91	93, 97	19, 19
2 ♀	88, 89	82, 87	18, 18

1132. *Pycnonotus cafer stanfordi* Deignan
Burmese Redvented Bulbul

Luanglong Khulen (3,250 ft.) 1 ♂ (29 Feb., 1936).

Imphal (c. 3000-3500 ft.) 5 ♂, 3 ♀ (14, 28, 29 Nov., 1945).

Uchathol, Jiribum 2 ♂ (27 Nov., 1992)

Churachandpur 2 ♀ (12, 14 Mar., 1992)

Hume (1888) found it common in the Western hills and less in the eastern hills of Manipur.

Measurements :	Wing	Tail	Bill
5 ♂	98-106	93-106	19-23
5 ♀	93-99	89-100	20-21

1133. *Pycnonotus striatus striatus* (Blyth)
Striated Green Bulbul

It has distributional range in Manipur.

1137. *Pycnonotus flavescens flavescens* Blyth
Blyth's Bulbul

It has distributional range in Manipur.

1140. *Criniger flaveolus flaveolus* (Gould)
Whitethroated Bulbul

Kanglatongbi, 16 miles N. of Imphal (c. 3,500 ft.) 1 ♂ (8 Dec., 1945).

Hume (1888) noted it common in dense scrub and creepers in the western hills of Manipur.

Measurements :	Wing	Tail	Bill
1 ♂	106	92	20

1141. *Hypsipetes viridescens cacharensis* (Deignan)
Olive Bulbul

It has distributional range in Manipur.

1146. *Hypsipetes maclellandi maclellandi* Horsfield
Rufousbellied Bulbul

Kalanaga (c. 3,250 ft.) 2 ♂ (17 Feb., 1936).

Hume (1888) found it fairly common in the eastern hills of Manipur and absent elsewhere.

Measurements :	Wing	Tail	Bill
2 ♂	105, 107	103, 113	23, 26

1147. *Hypsipetes flavalus flavalus* (Blyth)
Browneared Bulbul

It has distributional range in Manipur.

1151. *Hypsipetes madagascariensis nigrescens*
Baker

Assam Black Bulbul

It has distributional range in Manipur.

Family MUSCICAPIDAE

1159. *Pellorneum ruficeps vocale* Deignan

Manipur Spotted Babbler.

Chandal 1 ♂ (6 Mar., 1992).

It is restricted in the valley of central Manipur.

This species was described from Kanglatongbi, Manipur.

Measurements :	Wing	Tail	Bill
1 ♂	72	72	20

1164. *Pellornium albiventre albiventre*
(Godwin-Austen)

Assam Brown Babbler

It has distributional range in Manipur.

1166. *Trichastoma tickelli assamensis* (Sharpe)
Tickell's Babbler

Uchathol, Jiribum 1 ♀ (27 Nov., 1992).

Measurements :	Wing	Tail	Bill
1 ♀	61	53	18

1169. *Pomatorhinus schisticeps schisticeps*
Hodgson
East Himalayan Slatyheaded Scimitar Babbler

It is distributed in Manipur.

1184. *Pomatorhinus erythrogenys maclellandi*
Godwin-Austen
Assam Rustycheeked scimitar Babbler

Karong 1 ♀ (5 Nov., 1936).

Hume (1888) found it common in Manipur.

Measurements :	Wing	Tail	Bill
1 ♀	84	98	29

1187. *Pomatorhinus ferruginosus formosus*
Koelz
Assam Coralbilled Scimitar Babbler

It has distributional range in Manipur.

1190. *Pomatorhinus ochraceiceps austeni* Hume
Manipur Longbilled Scimitar Babbler

This race was described from Manipur.

Ripley (1982, p. 327) reported it from Meghalaya.

1192. *Xiphirhynchus superciliaris intextus*
Ripley
Assam Slenderbilled Scimitar Babbler

It is distributed in Manipur.

1193. *Rimator malacoptilus* Blyth
Longbilled Wren-Babbler

It has distributional range in Manipur.

1195. *Napothera epilepidota roberti* (Godwin-Austen & Walden)
Austen's Small Wren-Babbler

It has distributional range in Manipur.

1202. *Spelaeornis longicaudatus* (Moore)
Longtailed Wren-Babbler

It has distributional range in Manipur.

1203. *Spelaeornis chocolatinus chocolatinus*
(Godwin-Austen & Walden)
Streaked Longtailed Wren-Babbler

It has distributional range in Manipur.

1208. *Spelaeornis humei roberti* Godwin-Austen & Walden
Cachar Wedgebilled Wren

It has distributional range in Manipur.

1209. *Stachyris rufifrons ambigua* (Harington)
Assam Redfronted Babbler

It is distributed in Manipur.

1210. *Stachyris ruficeps ruficeps* Blyth
Redheaded Babbler

It is distributed in Manipur.

1212. *Stachyris chrysaea chrysaea* Blyth
Nepal Goldenheaded Babbler
It has distributional range in Manipur.
1228. *Macronous gularis rubricapilla* (Tickell)
Yellowbreasted Babbler
It has distributional range in Manipur.
1229. *Timalia pileata bengalensis* Godwin
Austen
Redcapped Babbler
It is distributed in NE India including Manipur.
1231. *Chrysoma sinense sinense* (Gmelin)
Yellow-eyed Babbler
It has distributional range in Manipur.
1242. *Paradoxornis nipalensis poliotis* (Blyth)
Blyth's or Assam Orange Parrotbill
It is distributed in NE India including Manipur.
1250. *Paradoxornis gularis transfluvialis*
(Hatert)
Assam Greyheaded Parrotbill
It has distributional range in Manipur.
1257. *Turdoides longirostris* (Hodgson)
Slenderbilled Babbler
It is distributed in NE India including Manipur.
1265. *Turdoides striatus striatus* (Dumont)
Bengal Jungle Babbler
It is distributed in the Indian Mainland including Manipur.
1275. *Garrulax monileger monileger* (Hodgson)
Necklaced Laughing Thrush
It is distributed in NE India including Manipur.
1278. *Garrulax pectoralis melanotis* Blyth
Assam Blackgorgeted Laughing Thrush
It has distributional range in Manipur.
1282. *Garrulax striatus cranbrookii* (Kinnear)
Assam Striated Laughing Thrush
It has distributional range in Manipur.
1284. *Garrulax leucolophus patkaicus*
Reichenow
Assam Whitecrested Laughing Thrush
It has distributional range in Manipur.
1285. *Garrulax chinensis nuchalis* Godwin
Austen
Chestnutbacked Laughing Thrush
It is distributed in NE India including Manipur.
1286. *Garrulax galbanus galbanus* (Godwin-Austen)
Yellowthroated Laughing Thrush
It is distributed in Manipur.
1288. *Garrulax delesserti gularis* (McClelland)
Yellow breasted Laughing Thrush
It is distributed in NE India including Manipur.
1291. *Garrulax cineraceus cineraceus*
(Godwin-Austen)
Ashy Laughing Thrush
Turibari, Kanpokpi, Senapati 1 ♂, 1 ♀ (9 Nov., 1992).
- | Measurements : | Wing | Tail | Bill |
|----------------|------|------|------|
| 1 ♂ | 86 | 98 | 28 |
| 1 ♀ | 85 | 96 | 28 |
1302. *Garrulax caerulatus livingstoni* Ripley
Nagaland Greysided Laughing Thrush
It's distributional range includes Manipur.
1303. *Garrulax ruficollis* (Jardine & Selby)
Rufousnecked Laughing Thrush
Karon 2 o (5 Feb., 1936).
Launglong Khulen 1 ♂ (8 Feb., 1936).
Hume (1888) found it very common in Manipur.
- | Measurements : | Wing | Tail | Bill |
|----------------|------|------|------|
| 1 ♂ | 100 | 113 | 21 |
1305. *Garrulax merulinus toxostominus* (Koelz)
Manipur Spotted breasted Laughing Thrush
This race was described from Korong, Manipur.

1306. *Garrulax sannio albosuperciliaris*
Godwin-Austen
Whitebrowed Laughing Thrush

Turibari, Kangpokpi, Senapati 1 ♀ (10 Nov., 1992).

Measurements :	Wing	Tail	Bill
1 ♀	—	104	23

1317. *Garrulax virgatus* (Godwin-Austen)
Manipur Streaked Laughing Thrush

It's distributional range includes Manipur.

1318. *Garrulax austeni austeni* (Godwin-Austen)
Browncapped Laughing Thrush

It is distributed in Manipur.

1319. *Garrulax squamatus* (Gould)
Bluewinged Laughing Thrush

It is distributed in NE India including Manipur.

1329. *Garrulax erythrocephalus godwini*
(Harrington)
Nagaland Redheaded Laughing Thrush

It's distributional range includes Manipur.

1330. *Garrulax erythrocephalus erythrolaema*
(Hume)
Manipur Redheaded Laughing Thrush

It's distributional range includes Manipur.

1332. *Garrulax phoeniceus bakeri* (Hartert)
Assam Crimsonwinged Laughing Thrush

It is distributed in NE India including Manipur.

1334. *Leiothrix argenteauris vernayi* (Mayr & Greenway)
Burmese Silvereared Mesia

It has distributional range in Manipur.

1336. *Leiothrix lutea calipyga* (Hodgson)
Eastern Redbilled Mesia

It is distributed in NE India including Manipur.

1339. *Cutia nipalensis nipalensis* Hodgson
Nepal Cutia

It has distributional range in Manipur.

1340. *Pteruthius rufiventer* Blyth
Rufoushebellied Shrike-Babbler.

It is distributed in NE India including Manipur.

1341. *Pteruthius flaviscapis validirostris* Koelz
Redwinged Shrike-Babbler

It has distributional range in Manipur.

1345. *Pteruthius melanotis melanotis* Hodgson
Chestnut-throated Shrike-Babbler

It is distributed in NE India including Manipur.

1347. *Gampsorhynchus rufulus rufulus* Blyth
Whiteheaded Shrike-Babbler

It is distributed in NE India including Manipur.

1350. *Actinodura egertoni khasiana* (Godwin-Austen)
Assam Barwing

It is distributed in NE India including Manipur.

1355. *Actinodura waldeni waldeni* (Godwin-Austen)
Manipur Barwing

It's distributional range includes Manipur.

1357. *Minla ignotincta ignotincta* Ali & Ripley
Redtailed Minla

It has distributional range in Manipur.

1361. *Minla strigula cinereigence* (Ripley)
Assam Barthroated Siva

It's distributional range includes Manipur.

1362. *Minla cyanouroptera cyanouroptera*
(Hodgson)
Bluewinged Siva

Nanglea Atrow (c. 3,250 ft.) 2♂ 1♀ (13, 14 Feb., 1936).

Hume (1888) found it common above 4,500 ft. in the western and eastern hills of Manipur.

Measurements :	Wing	Tail	Bill
2 ♂	61, 62	71	12, 13
1 ♀	60	60	13

1365. *Yuhina castaniceps castaniceps* (Moore)
Chesnut-headed Yuhina

It has distributional range in Manipur.

1366. *Yuhina bakeri Rothschild*
Whitenaped Yuhina

It is distributed in NE India including Manipur.

1370. *Yuhina flavicollis rouxi* (Oustalet)
Assam Yellowanped Yuhina

It is distributed in NE India including Manipur.

1372. *Yuhina gularis gularis* Hodgson
Eastern Stripethroated Yuhina

It is distributed in NE India including Manipur.

1374. *Yuhina nigrimenta nigrimenta* Hodgson
Blackchinned Yuhina

It is distributed in NE India including Manipur.

1375. *Yuhina xantholeuca xantholeuca*
(Hodgson)
Whitebellied Yuhina

It is distributed in NE India including Manipur.

1377. *Alcippe chrysotis albilineala* (Koelz)
Assam Goldenbreasted Tit-Babbler

It's distributional range includes Manipur.

1378. *Alcippe cinerea* (Blyth)
Dusky Green Tit-Babbler

It is distributed in NE India including Manipur.

1379. *Alcippe castaneiceps castaneiceps*
(Hodgson)
Chestnut-headed Tit-Babbler

It is distributed in NE India including Manipur.

1383. *Alcippe vinipectus austeni*
(Ogilvie-Grant)
Assam Whitebrowed Tit-Babbler

This race was described from Manipur and Naga Hills.

1385. *Alcippe cinereiceps manipurensis*
(Ogilvie-Grant)
Manipur Brownheaded Tit-Babbler

This race was described from Owen's Peak, Manipur Hills.

1387. *Alcippe rufogularis collaris* Walden
Assam Redthroated Tit-Babbler

It's distributional range includes Manipur.

1388. *Alcippe brunnea mandelli* (Godwin-Austen)
Rufousheaded Tit-Babbler

It's distributional range includes Manipur.

1391. *Alcippe poioicephala fusca* Godwin-Austen
Assam Quaker Babbler

Uchathal, Jiribam, Imphal 2 ♂, 2 ♀ (26, 27, 28 Nov., 1992).

Measurements :	Wing	Tail	Bill
2 ♂	67, 68	63, 67	16, 17
2 ♀	66, 67	62, –	15, 15

1392. *Alcippe nipalensis nipalensis* (Hodgson)
Nepal Quaker Babbler

Luagnlong Khunow (c. 3,250 ft.) 1 ♀ (9 Nov., 1936).

Hume (1888) reported it very common in many parts of Manipur.

Measurements :	Wing	Tail	Bill
1 ♀	59	55	12

1393. *Alcippe nipalensis commoda* Ripley
Mishmi quaker Babbler

Turibari, Kangpokpi, Senapati 2 ♂, 2 ♀ (11 Nov., 1992).

Measurements :	Wing	Tail	Bill
2 ♂	57, 59	–, 56	13, 13
2 ♀	57, 60	57, 59	13, 13

1395. *Heterophasia annectens annectens* (Blyth)
Chestnutbacked Sibia

It's distributional range includes Manipur.

1399. *Heterophasia gracilis* (McCelland)
Grey Sibia

Tairenpokpi (c. 3,000 ft.) 1 ♂ (7 Nov., 1936).

Baker (1922) extended its range upto Manipur.

Measurements :	Wing	Tail	Bill
1 ♂	92	119	21

1400. *Heterophasia pulchella* (Godwin-Austen)
Beautiful Sibia

It has distributional range in Manipur.

1408. *Muscicapa muttui muttui* (Layard)
Brownbreasted Flycatcher

It has distributional range in Manipur.

1410. *Muscicapa ferruginea* (Hodgson)
Ferruginous Flycatcher

It is distributed in Manipur.

1412. *Muscicapa parva albicilla* Pallas
Eastern Redbreasted Flycatcher

Chandal 1 ♀ (6 Mar., 1992).

Churachandpur 1 ♀ (12 Mar., 1992)

Measurements :	Wing	Tail	Bill
1 ♀	66, 69	50, 50	14, 14

1414. *Muscicapa strophata strophata*
(Hodgson)
Orange gorgeted Flycatcher

It's distributional range includes Manipur.

1416. *Muscicapa monileger leucops* (Sharpe)
Assam Whitegorgeted Flycatcher

It is distributed in NE India including Manipur.

1417. *Muscicapa hyperythra hyperythra* Blyth
Rufousbreasted Blue Flycatcher

It has distributional range in Manipur.

1418. *Muscicapa hodgsonii* (Verreaux)
Rustybreasted Blue Flycatcher

It is distributed in NE India including Manipur.

1420. *Muscicapa westermanni australorientis*
Ripley
Eastern Little Pied Flycatcher

It is distributed in NE India including Manipur.

1422. *Muscicapa superciliaris aestigma* G. R.
Gray
Little Blue and White Flycatcher

It has distributional range in Manipur.

1425. *Muscicapa leucomelanura cerviniventris*
(Sharpe)
Manipur Slaty Blue Flycatcher

This race was described from Manipur.

1426. *Muscicapa sapphira* Blyth
Sapphireheaded Flycatcher

It is distributed in NE India including Manipur.

1428. *Muscicapa grandis grandis* (Blyth)
Large Niltava

It is distributed in NE India including Manipur.

1430. *Muscicapa macgrigoriae signata*
(Horsfield)
Eastern Small Niltava

It is distributed in NE India including Manipur.

1432. *Muscicapa sundara sundara* (Hodgson)
Eastern Rufousbellied Niltava

Nanglea Atrow, Imphal 1 ♂ (12 Dec., 1936).

Turibari, Senapati 1 ♂, 1 ♀ (9, 19 Nov., 1992).

Baker (1924) extended its range upto Manipur.

Measurements :	Wing	Tail	Bill
2 ♂	79, 85	66, 71	12, 16

- 1 ♀ 76 64 16
1433. *Muscicapa viridis oatesi* (Salvadori)
Rufousbellied Blue Flycatcher
- It has distributional range in Manipur.
1437. *Muscicapa poliogenys cachariensis*
(Madarasz)
Eastern Brooks' Flycatcher
- It's distributional range includes Manipur.
1439. *Muscicapa uniclor unicolor* (Blyth)
Pale Blue Flycatcher
- It has distributional range in Manipur.
1440. *Muscicapa rubeculoides rubeculoides*
(Vigors)
Bluethroated Flycatcher
- It has distributional range (breeding) in Manipur.
1441. *Muscicapa banyumas magnirostris*
(Blyth)
Largebellied Blue Flycatcher
- It is distributed in NE India including Manipur.
1445. *Muscicapa thalassina thalassina*
Swainson
Verditer Flycatcher
- It is distributed in India including Manipur.
1448. *Culicicapa ceylonensis calochrysea*
Oberholser
Northern Greyheaded Flycatcher
- It is distributed in the Indian mainland including Manipur.
1450. *Rhipidura hypoxantha* Blyth
Yellowbellied Fantail Flycatcher
- It has distributional range in Manipur.
1456. *Rhipidura abdicollis stanleyi* Baker
NEFA Whitethroated Fantail Flycatcher
- It's distributional range includes Manipur.

1463. *Terpsiphone paradisi saturator*
(Salomonsen)
East Himalayan Paradise Flycatcher
- It has distributional range in Manipur.
1465. *Hypothymis azurea styani* (Hartlaub)
Indian Blacknaped Flycatcher
- Uchathol, Jiribam, Imphal 1 ♂ (26 Nov., 1992).
- | | | | |
|----------------|------|------|------|
| Measurements : | Wing | Tail | Bill |
| 1 ♂ | 73 | 76 | 16 |
1471. *Tesia cyaniventer* Hodgson
Yellow browed Ground Warbler
- It has distributional range in Manipur.
1472. *Tesia olivea* (McClelland)
Slatybellied Ground Warbler
- It has distributional range in Manipur.
1478. *Cettia fortipes fortipes* (Hodgson)
Strongfooted Bush Warbler
- It is distributed in NE India including Manipur.
1483. *Cettia flavolivacea alexanderi* Ripley
Manipur Aberrant Bush Warbler
- It's distributional range includes Manipur.
1497. *Cisticola exilis tyleri* Jerdon
Yellowheaded Fantail Warbler
- It's distributional range includes Manipur.
1501. *Prinia rufescens rufescens* Blyth
Rufous Wren-Warbler
- It is distributed in NE India including Manipur.
1502. *Prinia hodgsonii rufula* Godwin-Austen
Northern Ashy Grey Wren-Warbler
- It has distributional range in Manipur.
1512. *Prinia subflora fusca* (Hodgson)
Eastern Plain Wren-Warbler
- It's distributed in NE India including Manipur.

1516. *Prinia socialis inglisi* Whistler & Kinnear
Assam Ashy Wren-Warbler

It has distributional range in Manipur.

1525. *Prinia flaviventris flaviventris* (Delessert)
Assam Yellowbilled Wren-Warbler

It's distributional range includes Manipur.

1528. *Prinia criniger catharia* Reichenow
Assam Brown Hill-Warbler

It's distributional range includes Manipur.

1530. *Prinia atrogularis khasiana* (Godwin-Austen)
Assam Blackthroated Hill Warbler

It has distributional range in Manipur.

1534. *Graminicola bengalensis bengalensis* Jerdon
Large Grass Warbler

It is distributed in Manipur.

1537. *Orthotomus sutorius luteus* Ripley
Mishmi Tailor Bird

It has distributional range in Manipur.

1540. *Orthotomus atrogularis nitidus* Hume
Blacknecked Tailor Bird

It has distributional range in Manipur.

1548. *Megalurus palustris toklao* (Blyth)
Striated Marsh Warbler

Jiribam, Manipur 1 ♂ (20 Mar., 1992).

Measurements :	Wing	Tail	Bill
1 ♂	106	122	22

1554. *Acrocephalus orientalis* (Temminck & Schlegel)
Eastern Great Reed Warbler

It has distributional range in Manipur.

1555. *Acrocephalus bistrigiceps bistrigiceps* Swinhoe
Blackbrowed Reed Warbler

It has distributional range in Manipur.

1556. *Acrocephalus dumetorum* Blyth
Blyth's Reed Warbler

It has distributional range in Manipur.

1579. *Phylloscopus affinis affinis* (Tickell)
Tickell's Leaf Warbler

It is distributed in the Indian mainland including Manipur.

1585. *Phylloscopus fuscatus mariae* Ripley
Manipur Dusky Leaf Warbler

This race was described from Moirang, Manipur.

1588. *Phylloscopus pulcher pulcher* Blyth
Eastern Orangebarred Leaf Warbler

It is distributed in NE India including Manipur.

1591. *Phylloscopus inornatus mandellii* (Brooks)
Mandelli's Yellow-browed Leaf Warbler

It is distributed in NE India including Manipur.

1592. *Phylloscopus inornatus inornatus* (Blyth)
Siberian Yellow Browed Leaf Warbler

It has distributional range in Manipur.

1596. *Phylloscopus proregulus newtoni* Gaetke
Eastern Pallas' Leaf Warbler

It is distributed in NE India including Manipur.

1601. *Phylloscopus magnirostris* Blyth
Largebilled Leaf Warbler

It has distributional range in Manipur.

1607. *Phylloscopus occipitalis coronatus* (Temminck & Schlegel)
Eastern Crowned Leaf Warbler

It is distributed in Manipur.

1610. *Phylloscopus reguloides assamensis* Hartert
Assam Crowned Leaf Warbler

It is distributed in NE India including Manipur.

1611. *Phylloscopus reguloides claudiae* (La Touche)

Yunan Crowned Leaf Warbler

It has distributional range in Manipur.

1613. *Seicercus affinis* (Hodgson)
Allied Flycatcher Warbler

It has distributional range in Manipur.

1615. *Seicercus burkii burkii* (Burton)
Eastern Blackbrowed Fly catcher Warbler

Uchathol, Jiribam, Imphal 1 ♂ (26 Nov., 1992).

Chandal, Manipur 1 ♀ (6 Mar., 1992).

Measurements :	Wing	Tail	Bill
1 ♂	59	50	14
1 ♀	58	50	14

1619. *Seicercus xanthoschistos tephrodiras* Sick
Assam Greyheaded Flycatcher Warbler

It has distributional range in Manipur.

1620. *Seicercus poliogenys* (Blyth)
Greycheeked Flycatcher Warbler

It has distributional range in Manipur.

1621. *Seicercus castaniceps castaniceps* (Hodgson)
Chestnutheaded Flycatcher Warbler

It is distributed in NE India including Manipur.

1622. *Abroscopus superciliaris flaviventris* (Jerdon)
Sikkim Yellowbellied Flycatcher Warbler

It is distributed in NE India including Manipur.

1625. *Abroscopus schisticeps flavimentalis* (Baker)
Assam Blackfaced Flycatcher Warbler

It has distributional range in Manipur.

1626. *Abroscopus albogularis albogularis* (Horsfield & Moore)
White-throated Flycatcher Warbler

It is distributed in NE India including Manipur.

1639. *Brachypteryx leucophrys nipalensis* Hodgson

Lesser Shortwing

It is distributed to NE India including Manipur.

1640. *Brachypteryx montana cruralis* (Blyth)
Whitebrowed Shortwing

Nanglea Atrow (c. 3,250 ft.) 1 ♂, 2 ♀ (13, 14 Feb., 1936).

Roonwal & Nath (1948) first recorded it from Manipur.

Measurements :	Wing	Tail	Bill
1 ♂	71	48	—
2 ♀	65-68	46-47	15, —

1643. *Erithacus calliope* (Pallas)
Rubythroat

Uchathol, Jiribam, Imphal 1 ♂ (28 Nov., 1992).

Turibari, Senapati 1 ♀ (9 Nov., 1992).

Measurements :	Wing	Tail	Bill
1 ♂	73	61	16
1 ♀	74	61	17

1648. *Erithacus pectoralis confusus* (Hartert)
Eastern Rubythroat

It has distributional range in Manipur.

1650. *Erithacus brunneus brunneus* (Hodgson)
Indian Blue Chat

It has distributional range in Manipur.

1653. *Erithacus cyane cyane* (Pallas)
Siberian Blue Chat

Straggler. One record from Manipur (Hume 1888).

1658. *Erithacus chrysaeus chryseus* (Hodgson)
Eastern Golden Bush Robin

It has distributional range in Manipur.

1663. *Copsychus saularis erimelas* (Oberholser)
Assam Magpie Robin

Kanlatongbi, Imphal (c. 3,500 ft.) 1 unsexed (10 Dec., 1945).

Uchathol, Jiribam, Imphal 2♂ (19, 20 Nov., 1992).

Churachandpur 1♀ (12 Mar., 1992).

Roonwal & Nath (1948) found it common in the open country and listed this bird as *Copsychus saularis saularis* (Linnaeus).

Measurements :	Wing	Tail	Bill
1♂	97, 99	87, 91	20, 23
1♀	91	79	20

1667. *Copsychus malabaricus indicus* (Baker)
Indian Shama

It has distributional range in Manipur.

1672. *Phoenicurus ochruros rufiventris* (Vieillot)
Eastern Black Redstart

It has distributional range in Manipur.

1674. *Phoenicurus hodgsoni* (Moore)
Hodgson's Redstart

It has wintering distributional range in Manipur.

1675. *Phoenicurus frontalis* (Vigors)
Bluefronted Redstart

Turibari, Senapati 1♀ (11 Nov., 1992).

Measurements :	Wing	Tail	Bill
1♀	85	70	17

1677. *Phoenicurus aureus leucopterus* (Blyth)
Dauran Redstart

It has distributional range in Manipur.

1679. *Rhyacornis fuliginosus fuliginosus* (Vigors)
Plumbeous Redstart

Hume (1888) found it common in the western hills of Manipur.

Roonwal & Nath (1948) noted it occasionally on the banks of Imphal River and smaller streams running through evergreen forest.

1681. *Cinclidium leucurum* (Hodgson)
Whitetailed Blue Robin

It has distributional range in Manipur.

1685. *Enicurus immaculatus* (Hodgson)
Blackbacked Forktail

Nanglea Atrow, Imphal (c., 3,250 ft.) 2♀ (12 Feb., 1936).

Uchathol, Jiribam, Imphal 1♂ (27 Nov., 1992).

Hume (1888) found it common in the western hills but absent in the eastern hills.

Measurements :	Wing	Tail	Bill
1♂	87	126	21
1♀	87, 90	110, 115	15, –

1686. *Enicurus schistaceus* (Hodgson)
Slatyheaded Forktail

It has distributional range in Manipur.

1687. *Enicurus leschenaulti indicus* Hartert
Leschenault's Forktail

It has distributional range in Manipur.

1689. *Enicurus maculatus guttatus* Gould
Eastern Spotted Forktail

It has distributional range in Manipur.

1690. *Cochoa purpurea* Hodgson
Purple Cochoa

It has distributional range in Manipur.

1691. *Cochoa viridis* Hodgson
Green Cochoa

It has distributional range in Manipur.

1699. *Saxicola leucura* (Blyth)
Whitetailed Bush Chat

It has distributional range in Manipur.

1701. *Saxicola caprata burmanica* Baker
Burmese Pied Bush Chat

Imphal Valley (c., 2,500 ft.) 1♂ (3 Dec., 1945).

9 miles N. of Imphal (c., 3,500 ft.) 1♂ (29 Dec., 1945).

Hume (1888) found it common in the Manipur basin but absent in the hills.

Roonwal & Nath (1948) found it in the Imphal valley in small numbers and not found beyond 3,500 ft.

Measurements :	Wing	Tail	Bill
2♂	63, 69	52, 53	9, 10

1704. *Saxicola jerdoni* (Blyth)
Jerdon's Bush Chat

It has distributional range in Manipur.

1705. *Saxicola ferrea* Gray
Dark-grey Bush Chat

Chandal, Manipur 1 ♀ (9 Mar., 1992)

Measurements :	Wing	Tail	Bill
1 ♀	66	57	15

1716. *Chaimarrornis leucocephalus* (Vigors)
Whitecapped Redstart

Kanglatongbi, 16 miles N. of Imphal (c. 3,500 ft.) 2♂ (26 Nov., 1946).

Hume (1888) reported it common in the western hills but absent both in the eastern hills and Imphal valley.

Measurements :	Wing	Tail	Bill
2♂	100	77, 80	15, 16

1724. *Monticola rufiventris* (Jardine & Selby)
Chestnut bellied Rock Thrush

It has distributional range in Manipur.

1729. *Myiophonus caeruleus temminckii* Vigors
Himalayan Whistling Thrush

Luanlong Khulen, Manipur 1♂, 1♀ (8, 9 Feb., 1936).

Taisenpokpi, Manipur 1♂ (7 Feb., 1936).

Nanglea Atrow, Manipur 1♀ (14 Feb., 1936).

Kanglatongbi, 16-18 miles N. of Imphal 1♂, 4♀ (23, 26 Nov., & 18, 22, 23 Dec., 1945).

Hume (1888) found it in the western hills of Manipur but absent in the eastern hills.

Roonwal & Nath (1948) found it common on

the bank of the Imphal river and other hills streams.

Measurements :	Wing	Tail	Bill
3♂	168-179 (173)	120-134 (129)	28-34 (23)
6♀	167-177 (170)	121-139 (128)	26-34 (31)

1732. *Zoothera sibirica sibirica* (Pallas)
Whitebrowed Ground Thrush

It has distributional range in Manipur.

1733. *Zoothera citrina citrina* (Latham)
Orangeheaded Ground Thrush

It has distributional range in Manipur.

1739. *Zoothera millisima mollisina* (Blyth)
Eastern Plainbacked Mountain Thrush

It has distributional range in Manipur.

1740. *Zoothera dixonii* (Scebohm)
Longtailed Mountain Thrush

It has distributional range in Manipur.

1741. *Zoothera dauma dauma* (Latham)
Smallbilled Mountain Thrush

It has wintering distribution in Indian mainland including Manipur.

1745. *Zoothera monticola* Vigors
Large Brown Thrush

It has winter distributional range in Manipur.

1746. *Zoothera marginata* Blyth
Lesser Brown Thrush

It has distributional range in Manipur.

1747. *Turdus dissimilis dissimilis* Blyth
Blackbreasted Thrush

Regailous Camp, 63 miles W. of Imphal (c. 3,250 ft.) 1♀ (11 Feb., 1936).

Oates (1890) recorded specimens from that area.

Measurements :	Wing	Tail	Bill
1 ♀	123	80	18

1749. *Turdus albocinctus* Royle
Whitecollared Blackbird

It has distributional range in Manipur.

1750. *Turdus bouboul* (Latham)
Greywinged Blackbird

Launglong Khulen, Imphal (c. 3,250 ft.) 1 ♂, 1 ♀ (9 Feb., 1936).

Hume (1888) collected a pair of this bird from Barak valley, but did not meet with elsewhere.

Measurements :	Wing	Tail	Bill
1 ♂	147	112	25
1 ♀	139	112	25

1761. *Turdus feai* (Salvadori)
Fea's Thrush

It has wintering distributional in Manipur.

1762. *Turdus obscurus* Gmelin
Dark Thrush

It has distributional range in Manipur.

1763. *Turdus ruficollis atrogularis* Jarocki
Blackthroated Thrush

It has wintering distribution in Manipur.

1764. *Turdus ruficollis ruficollis* Pallas
Redthroated Thrush

It has distributional range in Manipur.

1776. *Cinclus pallasi dorjei* Kinnear
East Himalayan Brown Dipper

It has distributional range in Manipur.

1789. *Melanochlora sultanea sultanea*
(Hodgson)
Sultan Tit

It has distributional range in Manipur.

1793. *Parus major nipalensis* Hodgson
Nepal Grey Tit

Chandal, Manipur 2 ♂ (9 Mar., 1992).

Measurements :	Wing	Tail	Bill
2 ♂	64, 64	61, 66	12, 12

1799. *Parus monticolus monticolus* Vigors
Greenbacked Tit

It has distributional range in Manipur.

1812. *Parus spilonotus subviridis* Blyth
Assam Blackspotted Yellow Tit

It has distributional range in Manipur.

1814. *Sylviparus modestus modestus* Burton
Eastern Yellowbrowed Tit

It has distributional range in Manipur.

1820. *Aegithalo concinnus manipurensis*
(Hume)
Manipur Redheaded Tit

This race was described from Eastern Hills, Manipur.

1826. *Sitta europaea nagaensis* Godwin-Austen
Naga Nuthatch

It has distributional range in Manipur.

1828. *Sitta castanea cinnamomventris* Blyth
Eastern Chestnutbellied Nuthatch

It is distributed in NE India including Manipur.

1835. *Sitta himalayana australis* Koelz
Whitetailed Nuthatch

It has distributional range in Manipur.

1837. *Sitta formosa* Blyth
Beautiful Nuthatch

It is distributed in NE India including Manipur.

1838. *Sitta frontalis frontalis* Swainson
Velvetfronted Nuthatch

It has distributional range in Manipur.

1850. *Certhia discolor manipurensis* Hume
Manipur Tree Creeper

This race was described from Eastern Hills, Manipur.

1852. *Anthus hodgsoni hodgsoni* Richmond
Indian Tree Pipit

Churachandpur, Manipur 2♂ (12 Mar., 1992).

Chandal, Manipur 2♀ (9 Mar., 1992).

Measurements :	Wing	Tail	Bill
2♂	81, 82	60, 69	16, 16
2♀	77, 80	59, 60	16, 16

1859. *Anthus novaeseelandiae rufulus* Vieillot

Uchathol, Jiribam, Manipur 1♀ (29 Nov., 1992).

Measurements :	Wing	Tail	Bill
1♀	77	57	16

1864. *Anthus cervinus* (Pallas)
Redthroated Pipit

It has distributional range in Manipur.

1865. *Anthus roseatus* Blyth
Vinaceousbreasted Pipit

It has distributional range in Manipur.

1872. *Anthus spinoletta japonicus* Temminck
& Schlegel
Alpina Pipit

An erratic winter visitor to Manipur (Hime ?-1888).

1874. *Motacilla indica* Gmelin
Forest Wagtail

A wintering race in India including Manipur.

1884. *Motacilla caspica caspica* (Gmelin)
Grey Wagtail

Kanglatongbi, 16 miles N. Imphal (c. 3,500 ft.) 2♂, 1♀, 1 (unsexed) (22, 23 Dec., 1945).

Hume (1888) found it common in the western hills of Manipur and in the Imphal Valley.

Roonwal & Nath (1948) had the same view.

Measurements :	Wing	Tail	Bill
2♂	82, 87	95, 96	15
2♀	83	89	15
1 (unsexed)	85	93	15

1885. *Motacilla alba dukhunensis* Skyes
Indian White Wagtail

Kanglatorgbi, 16 miles N. Imphal (c. 3,500 ft.) 1♂ (12 Dec., 1845).

Imphal Valley (2,600 ft.) 1♂ (23 Dec., 1945)

Hume (1888) noted it scarce in Manipur while Roonwal & Nath (1948) found it common in Manipur.

Measurements :	Wing	Tail	Bill
2♂	91, 93	92, 95	15

1888. *Motacilla alba leucopsis* Gould
Whitefaced Pied Wagtail

Imphal Valley (c. 3,000 ft.) 1 unsexed (20 Dec., 1945).

Measurements :	Wing	Tail	Bill
1 (unsexed)	88	90	13

1889. *Motacilla alba ocularis* Swinhoe
Streaked Pied Wagtail

It has distributional range in Manipur.

1892. *Dicaeum agile agile* (Tickell)
Indian Thickbilled Flowerpecker

It is distributed in India including Manipur.

1895. *Dicaeum chrysorrheum chrysochlore*
Blyth
Yellowvented Flowerpecker

It is distributed in NE India including Manipur.

1896. *Dicaeum melanoxanthum* (Blyth)
Yellowbellied Flowerpecker

It has distributional range in Manipur.

1901. *Dicaeum concolor olivaceum* Walden
Plaincoloured Flowerpecker

It is distributed in NE India including Manipur.

1904. *Dicaeum cruentatum cruentatum*
(Linnaeus)
Scarletbacked Flowerpecker

It is distributed in NE India including Manipur.

1905. *Dicaeum ignipectus ignipectus* (Blyth)
Firebreasted Flowerpecker

It is distributed in NE India including Manipur.

1906. *Anthreptes singalensis rubinigentis* (Baker)
Rubycheek

It has distributional range in NE India including Manipur.

1910. *Nectarinia sperata brasiliana* (Gmelin)
Van Hasselt's Sunbird

It has distributional range in Manipur.

1920. *Aethopyga gouldiae isolata* Baker
Manipur Yellowbacked Sunbird

This race was described from Manipur.

1921. *Aethopyga gouldiae dabryi* (Verreaux)
Dabry's Sunbird

It has distributional range in Manipur.

1924. *Aethopyga nipalensis* Koelzi Ripley
Eastern Yellowbacked Sunbird

It has distributional range in Manipur.

1926. *Aethopyga saturata assamensis*
(McClelland)
Assam Blackbreasted Sunbird

It has distributional range in Manipur.

1928. *Aethopyga siparaja labecula* (Horsfield)
Assam Yellowbacked Sunbird

It has distributional range in Manipur.

1930. *Aethopyga ignicauda ignicauda*
(Hodgson)
Firetailed Yellow backed Sunbird

It has distributional range in Manipur.

1931. *Arachnothera longirostris longirostris*
(Latham)
Little Spiderhurter

Uchathol, Jiribam, Imphal 2♂, 1♀ (29, 27 Nov., 1992).

Measurements :	Wing	Tail	Bill
2♂	60, 67	36, 45	37, 37
1♀	64	41	37

1932. *Arachnothera magna magna* (Hodgson)
Streaked Spiderhunter

It is distributed in NE India including Manipur.

1933. *Zosterops palpebrosa palpebrosa*
(Temminck)
White-eye

Ragailows Camp, 63 miles Imphal (c. 3,250 ft.) 1♀ (11 Feb., 1936).

Hume (1888) found it common in the Imphal valley but absent in the hills.

Measurements :	Wing	Tail	Bill
1♀	53	36	11

1938. *Passer domesticus indicus* Jardine & Selby
Indian House Sparrow

Uchathol, Jiribam, Imphal, 1♀ (29 Nov., 1992).

Measurements :	Wing	Tail	Bill
1♀	70	51	15

1942. *Passer montanus malaccensis* Dubois
Tree Sparrow

Imphal (c. 2,600 ft.) 1♂, 1♀ (6 Feb., 1934).

Kanglatongbi, 16 miles N. Imphal (c. 3,500 ft.) 2♂, 2♀ (17, 18 Dec., 1945).

Hume (1888) found it very common in the Imphal Valley.

Roonwal & Nath (1948) had the same view as Hume. Both also mentioned that House Sparrow was entirely absent.

Measurements :	Wing	Tail	Bill
3♂	69-72	52-58	12
2♀	67-69	52-53	10-12

1944. *Passer montanus hepaticus* Ripley
Mishmi Tree Sparrow

Tamenglong, Manipur 1♂ (23 Nov., 1992).

Imphal 1♀ (16 Mar., 1992).

1947. *Passer rutilans intensior* Rothschild
Yunan Cinnamon Tree Sparrow

It has distributional range in Manipur.

1961. *Ploceus benghalensis* (Linnaeus)
Blackthroated Weaver Bird

It has distributional range in Manipur.

1967. *Lonchura striata acuticauda*
(Hodgson)
Whitebacked Munia

Uchathol, Jiribam, Imphal 2♂, 2♀ (27, 29 Nov., 1992).

Kanglatongbi, 16 miles N. Imphal (c. 3,500 ft.) 2♂, 2♀ (17, 18 Dec., 1945).

1977. *Lonchura malacca atricapilla* (Vieillot)
Eastern Blackheaded Munia

It has distributional range in Manipur.

1986. *Coccothraustes melanozanthos*
(Hodgson)
Spottedwinged Grosbeak

It has distributional range in Manipur.

1992. *Carduelis spinoides heinrichi*
Stresemann
Mt. Victoria Greenfinch

It has distributional range in Manipur.

2011. *Carpodacus erythrinus roseatus* (Blyth)
Indian Rosefinch

It is distributed in the Indian mainland including Manipur.

2033. *Propyrrhula subhimachala* (Hodgson)
Redheaded Rosefinch

It has distributional range in Manipur.

2037. *Pyrrhula nipalensis ricketti* La Touche
Chinese Brown Bullfinch

It has distributional range in Manipur.

2045. *Emberiza rutila* Pallas
Chestnut Bunting

It has distributional range in Manipur.

2046. *Emberiza aureola aureola* Pallas
Yellowbreasted Bunting

It has distributional range in Manipur.

2047. *Emberiza spodocephala sordida* Blyth
Blackfaced Bunting

It has distributional range in Manipur.

2055a. *Emberiza fucata fucata* Pallas
Amur Greyheaded Bunting

It has wintering distributional range in Manipur.

2056. *Emberiza pusilla* Pallas
Little Bunting

It has distributional range in Manipur.

2060. *Melophus lathami* (Gray)
Crested Bunting

It has distributional range in Manipur.

SUMMARY

This paper is dealt with the collections now preserved in the National Zoological Collection. Altogether total number of families, genera, species and subspecies known from India are 78, 405 and 2,110 respectively, of which the share of the State of Manipur is 59 families, 256 genera and 586 species and subspecies. Altogether eight races as cited below were described from the State of Manipur.

1159. *Pellornium ruficeps vocale* Dugnan
Manipur Spotted Babbler

1350. *Garrulax merulinus toxostaminus*
(Koelz)

Spottedbreasted Laughing Thrush.

1385. *Alcippe cinereiceps manipurensis*
(Ogilvie-Grant)

Manipur Brownheaded Tit Babbler

1425. *Muscicapa leucomelanura cerviniventris*
(Sharpe)

Manipur Slaty Blue Babbler

1585. *Phylloscopus fuscatus mariae* Ripley
Manipur Dusky Leaf Warbler

1820. *Aegithalos concinnus manipurensis*
 (Hume)

Manipur Redheaded Tit

1850. *Certhia discolor manipurensis* Hume
Manipur Tree Creeper

1920. *Aethopyga gouldiae isolata* Baker
Manipur Yellowbeaked Sunbird

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REFERENCES

- ALI, S. AND RIPLEY, S. D. 1968-1974. Handbook of the birds of India and Pakistan, together with those of Nepal, Sikkim, Bhutan and Ceylon, 10 vols. *Oxford University Press, Bombay*.
- GODWIN-AUSTEN, H. H. 1874. Fourth list of birds principally from the Naga Hills and Manipur, including those from the Khasi, Garo and Tipperah Hills. *J. Asiat. Soc. Beng.*, **43**(3) : 151-180.
- GODWIN-AUSTEN, H. H. (1874). Description of ten new birds from the Naga Hills and Manipur Valley, N. E. Frontier of Bengal. *Proc. Zool. Soc. Lond.*, 43-48.
- GODWIN-AUSTEN, H. H. 1882. On specimens of the male and female of *Phasianus humiae* from Manipur with description of the latter. *Proc. Zool. Soc. Lond.*, : 115-118.
- HUME, A. 1888. The birds of Manipur, Assam, Sylhet and Cachar. *Str. Feath.*, **11** (1-4) : 1-353.
- HIGGINS, J. C. The game birds and animals of the Manipur State with notes on their numbers, migration and habits. *J. Bombay Nat. Hist. Soc. vols.*, **36-37** (Part i-iv) : 406-422.

REPTILIA : SQUAMATA

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INTRODUCTION

Manipur, a small state, in the North-Eastern border of India, lies between 23°47' and 25°41' north latitude and 93°6' and 94°48' east longitude. Comprising mostly of hills, valleys, rivers, streams and lakes, it is bordered by Nagaland on the north, Myanmar in the east and south-east, Mizoram on the south-east and Assam on west. Manipur covers an area of 22,327 Sq. Km. The largest fresh water lake in the North-East, the Loktak lake and the only floating National Park in the world-keibul Lamjao—with its unique 'Sangai' or the "Dancing deer" add to the natural wealth of Manipur. Manipur also has the highest percentage of forest cover, i.e., 15,154 Sq. Km to state geographical area compared to any other state in India.

The state has a very rich wildlife wealth, but the representative collections of reptiles deposited at Eastern Regional Station, Zoological Survey of India, Shillong does not support this fact. Only nine species are available with the National Zoological Collection at Eastern Regional Station.

SYSTEMATIC ACCOUNT

Class **REPTILIA**

Order **SQUAMATA**

Sub-order **SAURIA**

Family **GEKKONIDAE**

1. *Cyrtodactylus khasiensis* (Jerdon)
2. *Hemidactylus bowringi* (Gray)
3. *Hemidactylus frenatus* Schlegel

Family **AGAMIDAE**

4. *Calotes emma* Gray
5. *Calotes mystaceus* Dumeril & Bibron
6. *Calotes versicolor* (Daudin)

Family **SCINCIDAE**

7. *Mabuya multifasciata multifasciata* (Kuhl)

Suborder **SERPENTES**

Family **COLUBRIDAE**

8. *Elaphe radiata* (Schlegel)
9. *Xenochrophis piscator* (Schneider)

Family **GEKKONIDAE**

Genus ***Cyrtodactylus*** Gray

1827. *Cyrtodactylus* Gray, *Phil. Mag.* (2) ii, 1827, 155.
1935. *Gymnodactylus* Spix, Smith 1935, *Fauna of British India*, II Sauria, 1-440.

Diagnostic characters : Digits clawed, beneath with a row of distinct transverse plates, eye with vertical pupil; 2 or 3 pair of post mentals.

1. *Cyrtodactylus khasiensis* (Jerdon)

1870. *Pentadactylus khasiensis* Jerdon, *P. Asiat. Soc. Beng.*, 1870, p. 75.
1991. *Gymnodactylus khasiensis* (Jerdon), Ahmed & Das Gupta, 1991, *Fauna of West Bengal* 2 : 1-65 (in press)

Material examined : 1 ex, India, Manipur, Litan, Ukhrul Road, 20.i.77, Coll. H. Khajuria.

Diagnostic characters : Upper labials 10 to 12 and as many lower labials; body and limbs dorsally with small granular scales intermixed with much

larger rounded keeled tubercles; a lateral fold of enlarged scales; belly with round imbricate scales, 30 to 40 across the middle; tail covered with small flat scales, those on the median line below larger than the others; a dorsal series of enlarged tubercles on the basal part; male with an angular series of 8 to 14 preanal pores. Light brown or greyish brown above with dark spots or markings more or less regularly arranged; head with brown spots; tail with brown bands; belly whitish.

Length Snout to vent 58 mm; tail 60 mm.

Distribution : Manipur; Assam; Meghalaya; West Bengal.

Elsewhere : Myanmar.

Genus *Hemidactylus* oken

1817. *Hemidactylus* oken, Isis, p. 1183.

1935. *Hemidactylus* oken, Smith, *Fauna of British India*, II, *Sauria*, 1-440.

Diagnostic characters : Digits strongly dilated with transversely divided lamellae beneath; terminal phalanges compressed, free or united with the exapanded portion; inner digit well developed with free, clawed, terminal phalanges; pupil vertical, males with preanal and or femoral pores.

2. *Hemidactylus bowringi* (Gray)

1845. *Doryura bowringii* Gray, *Cat. Liz. Brit. Mus.* p. 156.

1992. *Hemidactylus bowringi* (Gray) Ahmed & Dasgupta, *Fauna of West Bengal*, 2 : 1-65.

Material examined : 1 ex, India, Manipur, Moirang, 18.iii.74, Coll. K.R. Rao.

Diagnostic characters : Upper labials 9-11, lower labials 7-9; post mentals 2 pairs; back with small more or less uniform granules, belly with smooth rounded imbricate scales; 4th toe with 9 to 11 lamellae beneath; males with 12 to 15 femoral pores on each side. Light brown above with darker spots, tail with dark chevron shaped spots; whitish below.

Length Snout to vent 50 mm; tail 55 mm.

Distribution : Manipur; Godavari valley; Sikkim; West Bengal.

Elsewhere : China; Hongkong; Myanmar.

3. *Hemidactylus frenatus* Schlegel

1836. *Hemidactylus frenatus* Schlegel, *Erp. Gen.* iii. p. 366.

1992. *Hemidactylus frenatus* Schlegel, Ahmed & Dasgupta, *Fauna of West Bengal*, 2 : 1-65.

Material examined : 11 ex : 4 ex, India Manipur, Chandel, Moreh, 14.vi.92, Coll. R. Mathew; 2 ex, Churachandpur, 5.vi.92, Coll. R. Mathew; 2 ex, Bishenpur, Alt. 2700', 29.v.92, Coll. R. Mathew; 3 ex, Bishenpur, Loukoipat, 1.vi.92, Coll. R. Mathew.

Diagnostic characters : Upper labials 10-12, lower labials 8-10; post-mentals 2 pairs; gular region with small granular scales, snout with large granules; hinder part of head with small granules, back with small granules intermixed with round or conical tubercles, these enlarged tubercles vary considerably in number and may be absent altogether; belly with smooth, round, imbricate scales, 4th toe with 9 to 10 lamellae beneath; tail covered above with small scales and a series of six enlarged, pointed, tubercles arranged in regular rows; below with a median series of transversely enlarged scales; males with a continuous series of about 26-36 preano-femoral pores. Greyish or pinkish brown above, may be darker, with indistinct darker markings, sometimes arranged as longitudinal stripes, a dark line along the side of the head and a light one above it usually present; whitish below; tail sometimes coral red.

Length Snout to vent 58 mm; tail 50 mm.

Distribution : Manipur; Assam; Meghalaya; Southern India; Tripura; West Bengal.

Elsewhere : Hainan; Hongkong; Indo-China; Malay Peninsula; Sri Lanka; Australia; Africa; Yunnan.

Family AGAMIDAE

Genus *Calotes* Rafinesque

1815. *Calotes* Rafinesque, *Anal. Nat.* p. 75.

1935. *Calotes* Rafinesque, Smith, *Fauna of British India*, II : 1-440.

Diagnostic characters : Dorsal scales uniform; a dorsal crest more or less developed; tympanum exposed; tail long and slender.

4. *Calotes emma* Gray

1845. *Calotes emma* Gray, *Cat. Liz. Brit. Mus.* p. 244.

1935. *Calotes emma* Gray, Smith, *Fauna of British India*, II : 1-440.

Material examined : 2 ex : 1 ex, India, Manipur, Bishenpur, Loukoipat, Alt. 2700', 1.vi.92, Coll. R. Mathew; 1 ex, Imphal, 3 km. from Imphal on way to Chandel, 8.vi.92, Coll. R. Mathew.

Diagnostic characters : Canthus rostralis and superciliary edge sharp; a spine at the end of the supraciliary edge, and two more on the occiput between the tympanum and the nuchal crest, the posterior one situated just above the ear; dorsal scales larger than ventrals; and oblique fold in front of the shoulder covered with small granular scales. Olive brown above, a white dorso-lateral broad line starting from the upper labials to above the forelimb; throat brilliant deep peacock blue; light brown below; limbs and tail with brown or black transverse bands or stripes.

Length Snout to vent 108 mm; tail 180 mm.

Distribution : Manipur; Assam; Meghalaya.

Elsewhere : French Indo-China; Malay Peninsula; Myanmar; Siam; Yunnan.

5. *Calotes mystaceus* Dumeril & Bibron

1837. *Calotes mystaceus* Dum. & Bibr., *Erp. Gen.* iv, p. 408.

1935. *Calotes mystaceus* Dum. & Bibr., Smith, *Fauna of British India*, II : 1-440.

Diagnostic characters : Canthus rostralis and supraciliary edge sharp; no postorbital spine, two short separated spines or groups of 2 or 3 spines on each side of the back of the head; an oblique fold in front of the shoulder. Brownish gray or olivaceous above; dark lines radiating from eye; flanks with 3 or 5 large rusty red spots; upper lip white or yellow, the stripe extending to the shoulder.

Length Snout to vent 130 mm; tail 220 mm.

Distribution : Manipur.

Elsewhere : Myanmar; Siam; Cambodia; Cochin China; Annam.

6. *Calotes versicolor* Daudin

1802. *Agama versicolor* Daudin, *Hist. Nat. Rept.* iii, p. 395.

1992. *Calotes versicolor* (Daudin), Ahmed & Dasgupta, *Fauna of West Bengal*, 2 : 1-65.

Material examined : 8 ex : 2 ex, India, Manipur, Singhat, 26.iii.74, Coll. K. R. Rao; 1 ex, Tongbram on Sendra Road, 6 km. N.E. of Moirang, 21.vii.74, Coll. K.R. Rao; 2 ex, Ngaram on Sendra road, 5 km. east of Moirang, 21.iii.74, Coll. K.R. Rao; 1 ex, Khuigarik Reserve forest, 3 km. from Moreh IB, 19.i.76, Coll. A. K. Ghosh; 1 ex, Litan, Ukhrul Road, 20.i.77, Coll. H. Khajuria; 1 ex, Chandel, Khundengthabi, 13 km. N.W. of Moreh, Alt. 2200', 14.vi.92, Coll. R. Mathew.

Diagnostic characters : Two well separated spines on each side of the back of the head above the ear; dorsal scales larger than the ventrals, 35-58 scales round the body. Light brown or greyish above with more or less distinct transverse dark brown spots or bars upon the back and sides; dark streaks radiating from the eye; young and females often with two light dorso-lateral stripes, tail with light and dark annuli.

Length Snout to vent 82 mm; tail 230 mm.

Distribution : The whole of India.

Elsewhere : Afghanistan; Indo-Chinese Sub Region; China; Hainan; Hongkong; Malay Peninsula; Sri Lanka; Sumatra.

Family SCINCIDAE

Genus *Mabuya* Fitzinger

1926. *Mabuya* Fitzinger, *Class Rept.* pp. 23 & 52.

1935. *Mabuya* Fitzinger, Smith, *Fauna of British India*, II : Sauria, pp. 1-440.

Diagnostic characters : Eyelids movable, the lower with or without a more or less transparent disc; tympanum more or less deeply sunk.

7. *Mabuya multifasciata multifasciata* (Kuhl)

1820. *Scincus multifasciatus* Kuhl, *Beitr. Zool. Vergl. Anat.* p. 126.
1992. *Mabuya multifasciata multifasciata* (Kuhl), Ahmed & Dasgupta, *Fauna of West Bengal*, 2 : pp. 1-65.

Material examined : 2 ex : 1 ex, India, Manipur, Chandel, Moreh Reserve Forest, 19.i.76, Coll. A. K. Ghosh; 1 ex, Litan, Alt. 1050 meters, 20.i.77, Coll. S. G. Patil.

Diagnostic characters : Supranasals separated or just touching one another; prefrontals usually in contact with one another; a pair of nuchal; a post nasal; ear opening subcircular with small pointed lobules anteriorly; 30-34 scales round the middle of the body; dorsals with 3 or 5 keels. Brown or olive brown above, uniform or with dark brown or black longitudinal spots or streaks along the lateral margins of the scales; flanks dark brown or black, with or without white black edged spots; a pale dorso lateral line often present; upper head scales often margined with black; whitish below.

Length Snout to vent 120 mm; tail 140 mm.

Distribution : Manipur; Assam; Meghalaya; Nagaland; Nicobar Islands; West Bengal.

Elsewhere : East Indies; Hainan; Malay Peninsula; New Guinea : Pulo Condore; Tongking; Yunnan.

Family COLUBRIDAE

Genus *Elaphe* Fitzinger

1828. *Gonyosoma* Wagler, *Incon. Amphib.*, pl. ix.
1986. *Elaphe* Fitzinger, Murthy, *The Snake Book of India*, pp. 101.

Diagnostic characters : Scales in 19 to 27 rows with paired apical pits.

8. *Elaphe radiata* (Schlegel)

1837. *Coluber radiatus* Schlegel, *Phys. Serp.* ii, p. 135.
1986. *Elaphe radiata* (Schlegel), Murthy, *The Snake Book of India*, pp. 101.

Material examined : 1 ex., India, Manipur, Churachandpur, 3 km. North of Singnat, Alt. 3200', 4.vi.92, Coll. R. Mathew.

Diagnostic characters : Scales in 21 rows; ventrals 222-250; caudals 82-108 paired; Anal 1, preocular 1, post oculars 2; temporals 2 + 3. Reddish brown above with four black stripes in the anterior half or two thirds of the body, commencing a short distance behind the neck; the upper pair on either side of the vertebral line broader; the outer pair narrower, usually broken into a series of elongated spots on the anterior part of the body; a black bar across the acciput and three black streaks radiating from below the eye; the young are brightly patterned.

Total length 1610 mm; tail 340 mm.

Distribution : Manipur; Meghalaya.

Elsewhere : Eastern Himalayas; Indo-Chinese Sub Region; Malay Archipelago.

SUMMARY

A total of nine species under six genera and four families are recorded herein.

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REFERENCES

- SMITH, M.A. 1935. *Fauna of British India, including Ceylon and Burma. Reptilia and Amphibia. Vol. II Sauria* : 440. London (Taylor & Francis).
- SMITH, M.A., 1943. *Fauna of British India, Ceylon and Burma, including the whole of Indo-Chinese subregion. Reptilia and Amphibia III. Serpentes*, : 583. London (Taylor & Francis).

AMPHIBIA

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INTRODUCTION

Amphibian fauna of Manipur has been left more or less untouched till the publication of Anuran Fauna of north-east India by Chanda in 1994. Singh (1977) reports *Tylototriton verrucosus* (The Himalayan newt) from the state.

The present report will be the first consolidated faunal account of amphibians of Manipur which includes 14 species belonging to 7 genera, 5 families and 2 orders. The order Apoda is not represented in this account.

Authors are presuming that the number of species in the state will surely increase, if thorough surveys could be undertaken in the State in future, as 55 species of amphibians have so far been reported from north-east India.

MATERIAL AND METHODS

Amphibians are either aquatic, terrestrial or arboreal. Aquatic form could be collected by the help of water-net, a net fitted with a metal ring fixed at the end of a long bamboo pole, cast-net and fishing hook. Both terrestrial and arboreal forms could be collected by hand or long forceps. In the field, notes should be taken regarding the habits and habitats of the amphibians. For collection, aquatic vegetations, bush grown on moist soil, heap of rotten leaves, burrows made on elevated banks of ponds, canals, rivers, dark corner of village huts, undersurface of barks and holes on the trees, soil under stones etc. should be

explored. Nocturnal fauna should be explored by the help of lamps. The collected material are first chloroformed and then put into 5% formalin solution at least for 24 hours for fixation. Before putting in the formalin, an incision on the abdomen for the smaller specimens, and injection of 10% formalin solution inside the abdomen for larger specimens should be given for proper fixation of the viscera. The fixed material alongwith labels containing the data of locality, altitude, habitat, date of collection and name of collector would be packed properly and kept in 5% formalin solution again. Then the material would be studied and indentified with the help of literature in the laboratory.

Text-fig. 1. Illustrations of measurements and essential morphological characters used in the paper.

A 1 : Snout to vent length, A 2 : Snout length, A 3 : Head length, A 4 : Head width, A 5 : Tympanum, A 6 : Glandular dorso-lateral fold, A 7 : Width of interorbital space. B 1 : Foot length, B 2 : Suctorial disc, B 3 : Subarticular tubercles, B 4 : Inner metatarsal tubercle, B 5 : Outer metatarsal tubercle, B 6 : Webs of toes, C 1 : Position of tibiotarsal articulation when hind limb is kept parallel to body, C 2 : Tibia, C 3 : Tarsus. D 1 : Position of Choanae, D 2 : Position of Vomerine teeth. D 2 : Position of vomerine teeth, D 3 : Tongue (bifid). E 1 : Tongue (entire). F 1 : Cylindrical sacral vertebra. G 1 : Dilated sacral vertebra.

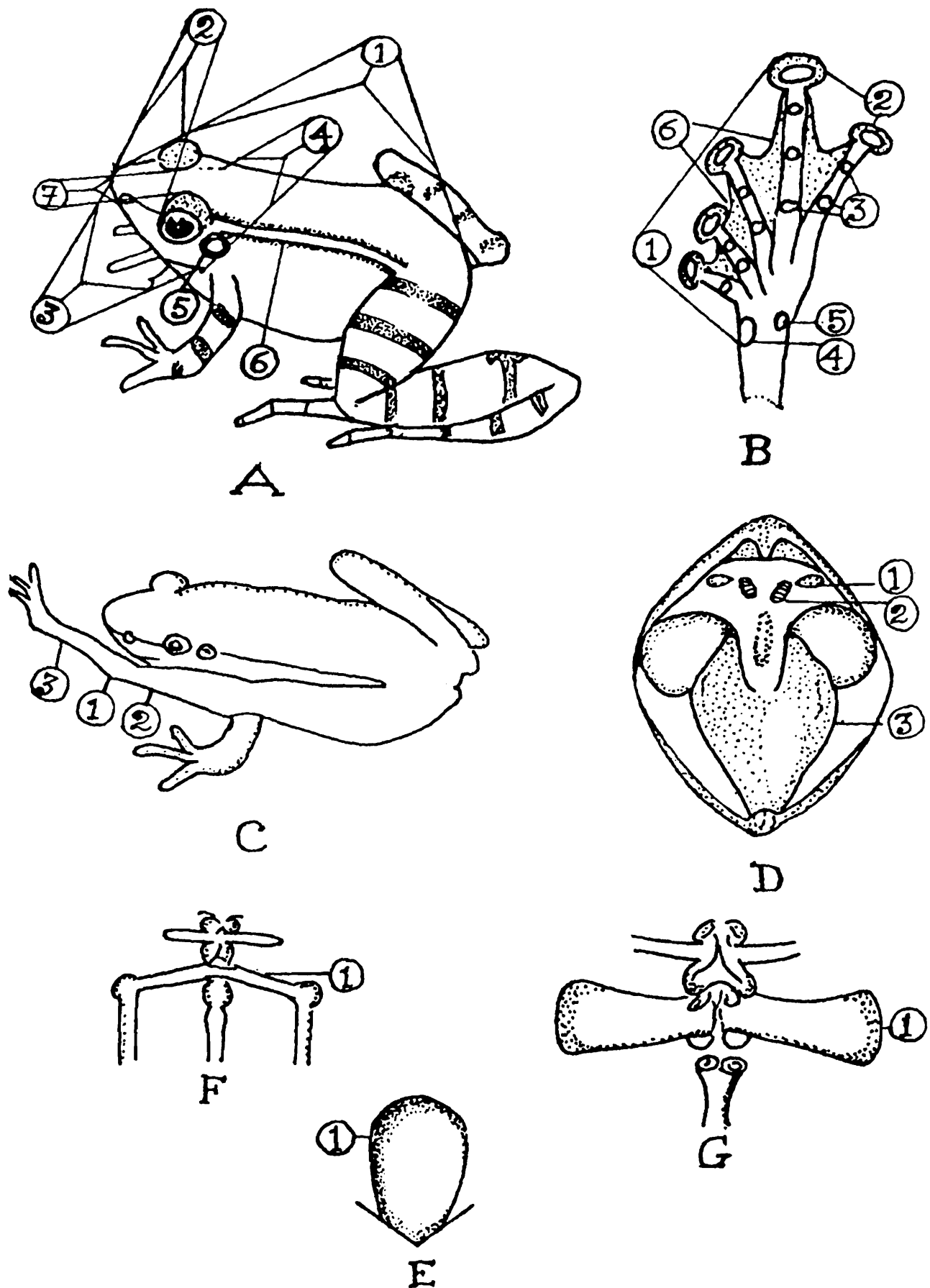


Fig. 1 : Illustration of measurements and essential morphological characters.

SYSTEMATIC ACCOUNT

Class AMPHIBIA

Order ANURA

Key to the Families

1. Jaws toothless 2
 Upper jaw toothed 3
2. Skin rough with well-developed warts, parotoids present BUFONIDAE
 Skin more or less smooth, parotoids absent MICROHYLIDAE
3. No intercalary ossification (extra cartilaginous bone) between the distal and penultimate phalanges RANIDAE
 An intercalary ossification between the distal and penultimate phalanges RHACOPHORIDAE

Family 1. BUFONIDAE**Genus 1. *Bufo* Laurenti**1768. *Bufo Laurenti*, *Synops. Rept.* : 25.
1. *Bufo melanostictus* Schneider
Common Indian Toad
1799. *Bufo melanostictus* Schneider, *Hist. Amph.*, 1 : 216.1890. *Bufo melanostictus* : Boulenger, *Fauna Br. India Rept. & Batr.*, : 505-507.1994. *Bufo melanostictus* : Chanda, *Mem. zool. Surv. India*, 18 (2) : 26-28.

Material examined : Several tadpoles, Near Wang-Jing village, Eile 18, on Burma Road, Manipur, alt. 2600 ft., 7-iii-1920, Manipur Survey; Several tadpoles, Hanjhahidel Kharangpat, Manipur, alt. 2600 ft, 14-iii-1920, Manipur Survey.

Diagnostic character : Head broader than long, with cornified bony ridges; snout rounded, nearly equal the diameter of the eye; nostril a little nearer to the tip of snout than to eye; interorbital width broader than that of upper eyelid; tympanum very distinct, two third diameter of the eye. Fingers free, first little longer than second, tips of fingers and toes swollen. Toes nearly half webbed, more

than three phalanges of fourth toe free; two oval (inner and outer) metatarsal tubercles present. Tarsometatarsal articulation reaches in between tympanum and eye. Dorsum dark brownish, rough with several spiny warts, parotoid large, kidney-shaped. Venter dull whitish with numerous small spiny warts.

Distribution : India : Manipur. Chanda (1992) reports it from Manipur. Common throughout the plains of India.

Elsewhere : Nepal, Sri Lanka, Myanmar, South China, Malaya Peninsula and Archipelego.

Remarks : Boulenger (1890) records its distributional range upto 10,000 feet in Sikkim Himalayas. Terrestrial and nocturnal in habit, found in and near water during breeding season.

Status : Very common.

Family II. MICROHYLIDAE**Genus 2. *Microhyla* Tschudi**1838. *Microhyla* Tschudi, *classif. Batr.*, : 71.
2. *Microhyla ornata* (Dumeril and Bibron)
Ornate Microhylid
1841. *Engystoma ornatum* Dumeril and Bibron, *Erpet. Gen.*, 8 : 745.1890. *Microhyla ornata* : Boulenger, *Fauna Br. India Rept. & Batr.*, : 491-492.1934. *Microhyla ornata* : Parker, *Monogr. Microhylidae* : 139-141.1994. *Microhyla ornata* : Chanda, *Mem. zool. Surv. India*, 18 (2) : 38-39.

Material examined : Nil, record from published literature.

Diagnostic character : Head broader than long; snout obtusely pointed, a little longer than the diameter of the eye; nostril nearer to the tip of snout than the eye; interorbital width a little broader than that of upper eyelid; tympanum not so distinct. Fingers free, first shorter than second, tips flattened. Toes with a rudiment of web, tips blunt; two small but distinct oval (inner and outer) metatarsal tubercles present. Tibiotarsal

articulation reaches near to eye. Dorsum smooth, brownish with broad darker markings. Venter smooth, dull whitish, little darker on throat.

Distribution : India : Manipur; Assam; Meghalaya; Mizoram; Nagaland; Tripura; Andhra Pradesh; Madhya Pradesh; Kerala; West Bengal; Gujarat and Andaman.

Elsewhere : Pakistan, Nepal, Bangladesh, Sri Lanka, Myanmar, South China, South east Asia and Taiwan.

Remarks : Commonest form of microhylid frogs found in India. It frequents inside bushes grown on moist soil.

Status : Common.

Family III. RANIDAE

Family Ranidae is represented by two genera in Manipur, of which genus *Amolops* Cope, 1865 is distinguished by its tadpoles possessing "large adhesive belly disc" just below the mouth (Inger, 1966).

Genus 3. *Amolops* Cope

1865. *Amolops* Cope, *Nat. Hist. Rev.*, N. S., 5 : 117.

3. *Amolops afghanus* (Günther)

1858. *Polypedates afghana* Günther, *Cat., Batr. Sal. Coll. Br. Mus.*, : 81.

1974. *Amolops afghanus* : Dubois, *Bull. Mus. Nalt. Hist. Nat.*, 143 (213) : 356-357.

1992. *Amolops afghanus* : Chanda, *J. Bengal Nat. Hist. Soc.*, 11 (1) : 30.

Material examined : 1 ex., Morek, Monipur, 8-ii-1993, H. T. Singh.

Measurements : Snout to vent length 66 mm.

Diagnostic character : Head as long as broad or a little broader than long; snout rounded, equals the diameter of the eye; nostril equidistant from the tip of the snout and the eye; interorbital width nearly equal to that of the upper eyelid; tympanum almost indistinct, covered by granules, less than half diameter of the eye. Fingers free, first generally a little shorter than second, tips with well developed large discs; subarticular

tubercles of fingers and toes distinct. Toes fully webbed, web feebly notched, web reaches middle of the disc of the fourth toe, tips with distinct and large discs; inner metatarsal tubercle elliptical, outer metatarsal tubercle absent. Tibiotarsal articulation reaching beyond the tip of the snout. Dorsum olive green and granular, a distinct glandular fold above the tympanum, glandular dorsolateral fold absent. Venter light yellowish, granular on belly and posterior part of thighs.

Distribution : India : Manipur; Sikkim; Punjab; Meghalaya; West Bengal.

Elsewhere : Nepal, Myanmar, Thailand, Yunnan and Tibet.

Remarks : Chanda (1992) reported it from Manipur.

Status : Not common.

Genus 4. *Rana* Linnaeus

1758. *Rana* Linnaeus, *Syst. Nat. Ed.* 10, 1 : 210.

Key to the species of the Genus *Rana*

1. Tips of toes with discs 2
 Tips of toes without discs 3
2. Dorsal skin entirely smooth *livida*
 Dorsal skin on sacral region tuberculated
 *mawphlongensis*
3. Toes webbed upto the tips 4
 Toes webbed not upto the tips 5
4. Inner metatarsal tubercle digitiform (toe-like)
 *cyanophylactis*
 Inner metatarsal tubercle oval *ghoshi*
5. Outer metatarsal tubercle present *limnocharis*
 Outer metatarsal tubercle absent *tigerina*

4. *Rana livida* (Blyth)

1855. *Polypedates livida* Blyth, *J. Asiat. Soc. Bengal*, 24 : 718.

1920. *Rana livida* : Boulenger, *Rec. Indian Mus.*, 20 : 214-216.

1994. *Rana livida* : Chanda, *Mem. zool. Surv. India*, 18 (2) : 80-82.

Material examined : Nil; record from published literature.

Diagnostic character : Head mostly as long as broad; snout rounded, generally longer than the eye; nostril nearer to the tip of the snout than the eye; interorbital width longer than of upper eyelid; tympanum distinct, more than half diameter of the eye. Fingers with rudiment of that web, first equals second, tips with large discs containing groove separating the upper from the lower surface; subarticular tubercles of fingers and toes large, distinct. Toes entirely webbed, tips with discs similar to those of fingers, but smaller; inner metatarsal tubercle long, compressed, outer metatarsal tubercle absent. Tibiotarsal articulation reaching beyond the tip of snout. Dorsum dark brown (in spirit), smooth, Venter dull whitish, smooth, granules on under surface of thighs.

Distribution : India; Manipur; West Bengal; Meghalaya and Assam.

Remarks : Chanda (1992) reported it from Manipur.

Status : Rare.

5. *Rana mawphlongensis* Pillai & Chanda
Current Name : *Limnonectes mawphlangensis*
(Pillai & Chanda)

1977. *Rana mawphlongensis* Pillai & Chanda, *J. Bombay nat. Hist. Soc.*, **74** (1) : 136-140.

1985. *Rana mawphlongensis* : Frost, *Amphibian species of the World*, : 504.

1994. *Rana mawphlongensis* : Chanda, *Mem. zool. Surv. India*, **18** (2) : 84-86.

Material examined : Nil; record from published literature.

Diagnostic character : Head as long as broad; snout pointed, a little longer than eye; nostril equidistant from the tip of snout and the eye; tympanum distinct, more than half diameter of the eye. Fingers free, first slightly longer than second, tips with small discs; subarticular tubercles of fingers and toes well developed. Toes nearly fully webbed, tips with distinct discs; inner metatarsal tubercle moderately prominent, outer metatarsal tubercle absent. Tibiotarsal articulation reaching tip of snout. Dorsum bluish black, smooth

upto sacral region, rest of glandular. Venter white smooth.

Distribution : India; Manipur; West Bengal and Meghalaya.

Remarks : Chanda (1992) reported it from Manipur.

Status : Rare.

6. *Rana cyanophlyctis* Schneider
Skipping Frog

Current Name : *Euphlyctis cyanophlyctis*
(Schneider)

1799. *Rana cyanophlyctis* Schneider, *Hist. Amph.*, **1** : 137.

1920. *Rana cyanophlyctis* : Boulenger, *Rec. Indian Mus.*, **20** : 12.

1994. *Rana cyanophlyctis* : Chanda, *Mem. zool. Surv. India*, **18** (2) : 62-64.

Material examined : 1 ex., Fish breeding Farm, Jiribam, Imphal dist., Manipur, 18-iii-1993. A. K. Karmakar.

Measurements : Snout to vent length 33 mm.

Diagnostic character : Head broader than long; snout generally rounded, equal or a little longer than the diameter of the eye; nostril equidistant from the tip of the snout and the eye; interorbital width much smaller than that of the upper eyelid; tympanum distinct, nearly once the diameter of the eye. Fingers free, first equals second, tips pointed; subarticular tubercles of fingers and toes feebly prominent. Toes fully webbed, tips swollen; a pointed digit-like inner metatarsal tubercle present, outer metatarsal tubercle absent. Tibiotarsal articulation reaches in between posterior end of tympanum and nostril. Dorsum darker with small warts. Venter whitish and smooth.

Distribution : India : Manipur. Throughout the plains of India, and up to 1856 m. in the Himalayas. Also Pakistan, Afghanistan, Iran, South Arabia, Nepal, Thailand and Sri Lanka.

Remarks : It is a very common species throughout the plains of India, and recorded from adjoining state of Manipur, Viz. Tripura, Meghalaya Assam and Arunachal Pradesh.

Status : Very common.

7. *Rana ghoshi* Chanda

Current Name : *Euphlyctis ghoshi* (Chanda)

1990. *Rana ghoshi* Chanda, *Hamadryad*, **15** (1) : 16-17.

1994. *Rana ghoshi* : Chanda, *Mem zool. Surv. India*, **18** (2) : 72-73.

Material examined : Nil; record from published literature.

Diagnostic character : Head broader than long; snout rounded, slightly projecting beyond lower jaw; nostril much closer to eye than to tip of snout; interorbital space about one and half times of interorbital width; tympanum half the diameter of eye. Fingers free, first slightly longer than second; tips rounded; subarticular tubercles of fingers and toes small but very prominent. Toes fully webbed; tips rounded; inner metatarsal tubercle oval, prominent; outer metatarsal tubercle absent. Tibiotarsal articulation reaching tympanum. Dorsum light brown with dark irregular blotches. Ventram pale. Skin on dorsum rough with small tubercles. Ventram smooth. A glandular dorsolateral fold extends from eyes to posterior region of the body, ending near the groin.

Distribution : India : Manipur.

Remarks : It is found to occur in the overhanging vegetation near the small stream, and is a diurnal species (Chanda, 1994).

Status : Rare.

8. *Rana limnocharis* Boie

Cricket Frog

Current Name : *Fejervarya limnocharis*
(Graver horn)

1835. *Rana limnocharis* (boie) Wiegmann. *N. Acta. Ac. Leop-Carol* **17** (i) : 255.

1920. *Rana limnocharis* : Boulenger, *Rec. Indian Mus.*, **20** : 28.

1994. *Rana limnocharis* : Chanda, *Mem Zool. Surv. India*, **18** (2) : 76-78.

Material examined : 1 ex., Thanga Island, Manipur, Assam, 25.ii.1920, Manipur Survey ; 1 ex., N. of Liktak Lake, Manipur, alt 2,600 ft., 18.ii.1992, Manipur Survey. 1 ex., Hamding vill., Ukhrul, Manipur, 8-3-1993, A. K. Karmakar.

Measurements : Snout to vent length 32-38 mm.

Diagnostic character : Head generally as long as broad; snout generally pointed, projecting beyond the mouth, as long as or a little longer than the diameter of the eye, nostril nearer to the tip of snout than the eye; interorbital width much smaller than that of the upper eyelid : tympanum distinct, nearly two-third the diameter of the eye. Fingers free, first longer than second, tips swollen; subarticular tubercles of fingers and toes distinct. Toes half-webbed, normally three phalanges of fourth toe free; a distinct oval inner metatarsal tubercle and a feebly distinct outer metatarsal tubercle present. Tibiotarsal articulation reaches in between tympanum and nostril. Dorsum greyish and warty. Venter whitish and smooth.

Distribution : India : Manipur. Chanda (1992) reports it from Manipur. It is broadly distributed species in India and found in almost all the biotopes of the Country.

Elsewhere : Eastern Asia from Pakistan, Nepal, Sri Lanka and China to Japan.

Remarks : This is a common terrestrial frog generally found in moist cultivated land, and inside bushes near water.

Status : Very common.

9. *Rana tigerina* Daudin

Indian Bull Frog

Current Name : *Hoplobatrachus tigerinus*
(Daudin)

1803. *Rana tigerina* Daudin, *Hist. Rain. Gren. Crip.*, p. 64.

1920. *Rana tigerina* : Boulenger, *Rec. Indian Mus.*, **20** : 17-20.

1994. *Rana tigerina* : Chanda, *Mem Zool. Surv. India* **18** (2) : 87-90.

Material examined : 1 ex., Morek, Manipur, 8-ii-1993, H. T. Sing.

Measurements : Snout to vent length 90 mm.

Diagnostic character : Head as long as broad or a little broader than long; snout rounded or pointed, projecting beyond the mouth, longer than the diameter of the eye; nostril generally equidistant from the tip of snout and the eye; interorbital width much smaller than that of the upper eyelid; tympanum, distinct, nearly equal to the diameter of the eye; Fingers free, first longer than second, tips not sharply pointed; subarticular

tubercles of fingers and toes not very distinct. Toes entirely webbed, tips not pointed; a blunt, not shovel-shaped, inner metatarsal tubercle present, outer metatarsal tubercle absent. Tibiotarsal articulation reaches in between posterior end of eye to nostril. Dorsum olive green with darker spots, distinct warts and long glandular folds. Venter whitish and smooth.

Distribution : India : Manipur. Chanda (1992) reports it from Manipur. The species is common throughout India from the base of the Himalaya to Southern part of the country

Elsewhere : Nepal, Sri Lanka, Myanmar, Thailand, South China and Taiwan.

Remarks : Commonest species of edible frogs found all over India.

Status : Common.

Family IV RHACOPHORIDAE

Key to the Genera of Family RHACOPHORIDAE

Toes not completely webbed, interspace between vomerine processes narrow
..... *Polypedates*

Toes completely webbed, interspace between vomerine processes wide *Rhacophorus*

Genus 5 *Polypedates* Tschudi

1838. *Polypedates* Tschudi, *Classif Batr.* : 34.

10. *Polypedates leucomystax* (Gravenhorst) Tree Frog

1829. *Hyla leucomystax* Gravenhorst, *Delic. Vralislay.*, 1 : 26.

1889. *Rhacophorus leucomystax* : Boulenger, *Proc. Zool. Soc. London* : 29.

1986. *Polypedates leucomystax* : Inger and Dutta, *J. Bombay nat Hist. Soc.*, 83 : 139.

1994. *Polypedates leucomystax* : Chanda, *Mem. zool. Surv. India*, 18 (2) : 113-114.

Material examined : 4 ex., a stream near Potsengha, Manipur, 19.iii.1920, Manipur Survey.

Measurements : Snout to vent length 27-46 mm.

Diagnostic character : Head broader than long, skin on head rugose; snout not pointed, projecting a little beyond the mouth, greater than the diameter of the eye; nostril nearer to the tip of the snout than to the eye; interorbital width much broader than that of the upper eyelid; tympanum distinct, about three-fourth diameter of the eye. Fingers free, first equals the second, tips of fingers and toes bears horse-shoe shaped distinct discs; subarticular tubercles of fingers and toes distinct. Toes three-fourth webbed, one phalange of fourth toe free; a distinct oval inner metatarsal tubercle present, outer metatarsal tubercle absent. Tibiotarsal articulation reaches in between eye and tip of snout. Dorsum light chocolate and smooth. Venter dull whitish and granular.

Distribution : India : Manipur; Mizoram; Tripura; Meghalaya; Nagaland; Assam; Arunachal Pradesh and West Bengal.

Elsewhere : South China to Malayasia.

Remarks : Chanda (1992) reports it from Manipur.

Status : Rare.

Genus 6 *Rhacophorus* Kuhl and van Hasselt

1822. *Rhacophorus* Kuhl and van Hasselt, *Algemeene Konst-en-latter-Bode*, 7 : 104.

Key to the species of the Genus *Rhacophorus*

1. Tibiotarsal articulation reaching posterior corner of eye *bipunctatus*

Tibiotarsal articulation reaching beyond the posterior corner of eye 2

2. Nostril nearer the tip of the snout than the eye; tibiotarsal articulation reaching nostril to beyond the tip of the snout *nigropalmatus*

Nostril equidistant from the tip of the snout and the eye, tibiotarsal articulation reaching in between the eye and nostril *maximus*

11. *Rhacophorus bipunctatus* Ahl

1927. *Rhacophorus bipunctatus* Ahl, Sitz. Ges. Naturf. Freunde Berlin., 147.
 1985. *Rhacophorus bipunctatus* Frost, *Amphibian species of the World*, : 543.
 1994. *Rhacophorus bipunctatus* : Chanda, *Mem. Zool. Surv. India*, **18** (2) : 116-117.

Material examined : Nil; record from published literature.

Diagnostic character : Head broader than long; snout obtusely pointed; nostril equidistant from the tip of snout and the eye; interorbital width greater than that of eye; tympanum distinct, two-third of eye. All fingers webbed to discs except the first; first finger shorter than second; subarticular tubercles moderately large and prominent. Toes fully webbed to the discs; outer metatarsal completely separated by web; subarticular tubercles small and prominent; a small inner metatarsal tubercle present; outer metatarsal tubercle absent. Tibiotarsal articulation reaching posterior corner of eye; heels strongly overlapping when hindlimbs folded at right angles to body. Dorsum green to olive, leaf green in life. Ventrally whitish. Black spots are very prominent on flanks. The number of spots are variable, sometimes two large spots occur on the right side, three smaller spots on the left. Generally the anterior spot is larger than others. Dorsal skin smooth. Bally, lateral sides of body and thighs fully granulated.

Distribution : India : Manipur; Arunachal Pradesh; Assam; Nagaland; Tripura.

Elsewhere : Indonesia.

Remarks : Chanda (1992 and 1994) reported it from Manipur.

Status : Rare.

12. *Rhacophorus nigropalmatus* Boulenger

1895. *Rhacophorus nigropalmatus* Boulenger, *Ann. Mag. Nat. Hist.*, (6) **16** : 170.
 1992. *Rhacophorus nigropalmatus* : Chanda, *J. Bengal nat. Hist. Soc.*, **11** (1) : 32.

Material examined : Nil; record from published literature.

Diagnostic character : Head a little broader than long; snout rounded, as long as the diameter of the eye; nostril nearer the tip of the snout than the eye; interorbital width broader than that of upper eyelid; tympanum distinct, half to two-third the diameter of the eye. Fingers fully webbed to the discs, first finger shorter than second, tips with distinct discs; subarticular tubercles of fingers and toes distinct. Toes fully webbed to the discs; a small pointed inner metatarsal tubercle present, outer metatarsal tubercle absent. Tibiotarsal articulation reaching nostril to beyond the tip of the snout. Dorsum darty white, smooth or finely granular. Venter cream colour, coarsely granular.

Distribution : India : Manipur; Arunachal Pradesh; Meghalaya; Nagaland; Mizoram; Assam.

Elsewhere : Sumatra, Borneo, Thailand and Malayasia.

Remarks : Chanda (1992) reported it from Manipur.

Status : Rare.

13. *Rhacophorus maximus* Günther

1858. *Rhacophorus maximus* Günther, *Cat. Batr. Sal., Br. Mus.*, : 83.
 1895. *Rhacophorus nigropalmatus* Boulenger, *Ann. Mag. nat. Hist.*, **16** : 170.
 1985. *Rhacophorus maximus* : Frost, *Amphibian Species of the World*, : 545.
 1994. *Rhacophorus maximus* : Chanda, *Mem. Zool. Surv. India.*, **18** (2) : 119-120.

Material examined : Nil; record from published literature.

Diagnostic character : Head a little broader than long; snout rounded, as long as the diameter of the eye; nostril equidistant from the tip of snout and the eye; interorbital width much broader than that of upper eyelid; tympanum distinct, more than half diameter of the eye. Fingers entirely webbed, web reaches the base of discs at the tips of fingers, first shorter than second; subarticular tubercles of fingers and toes well-developed. Toes fully webbed to the discs; an oval distinct inner

metatarsal tubercle present, outer metatarsal tubercle absent. Tibiotarsal articulation reaching in between the eye and the nostril. Dorsum greenish and smooth, heel without triangular dermal appendage; black spots behind the arm absent. Venter white, granular.

Distribution : India : Manipur; Meghalaya; Assam; Arunachal Pradesh; Nagaland; Mizoram.

Elsewhere : Nepal, Southern China and Thailand.

Remarks : Chanda (1992 and 1994) reported it from Manipur.

Status : Rare.

Order CAUDATA

Family V SALAMANDRIDAE

Genus 7 *Tylototriton* Anderson

1871. *Tylototriton* Anderson, *Proc. Zool. Soc. London* : 423.

14. *Tylototriton verrucosus* Anderson The Himalayan Newt

1871. *Tylototriton verrucosus* Anderson, *Proc. Zool. Soc. London*, : 423.

1890. *Tylototriton verrucosus* : Boulenger, *Fauna Br. India Rept. & Batr.* : 514.

1977. *Tylototriton verrucosus* : Singh, *Science Report*, 14 (ii) : 712-722.

1992. *Tylototriton verrucosus* : Sarkar *et al*, *State fauna Series 3* : (Zool. Surv. India) : *Fauna of West Bengal* : 79.

Material examined : 4 ex., Manipur, -xi.1976, N. Ekendra Singh.

Measurement: Largest : Snout to vent length 98 mm. and vent to tip of tail length 67 mm.
Smallest : Snout to vent length 38 mm. and vent to tip of tail length 32 mm.

Diagnostic character : Head broader than long; surrounded by hard porous ridge; snout short, blunt tipped, larger than that diameter of the eye; nostril nearer the tip of the snout than the eye; tympanum indistinct. Finger and toes moderate and free, tips blunt. Body 3 to 3½ times the length of the head. Tail flat, as long as or a little longer than the head and body. A broad and distinct porous vertebral ridge; a series of 15 to 16 knob-like porous glad along each side of dorsum, the last three behind the leg. Anal opening a longitudinal slit. Dorsum tubercular, dark brown, partotoids large and distinct, wrinkled on belly, granular on throat and under surface of limbs, a distinct gular fold.

Distribution : India : Manipur; West Bengal; Sikkim; Arunachal Pradesh.

Elsewhere : Nepal, Thailand and Western China.

Remarks : Singh (1977) reported the species first time from Manipur. It frequents inside stagnant water found in the hill-pockets.

Status : Rare.

SUMMARY

This is the first consolidated faunal account of amphibians of Manipur which includes 14 species, 7 genera, 5 families and 2 orders. Keys, illustrations of essential morphological characters to follow the key, and short diagnostic characters of the species have been added in the paper for determination of the species.

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REFERENCES

- BOULENGER, G. A. 1890. The fauna of British India, including Ceylong and Burma, Reptilia and Batrachia. London (Taylor & Francis), : xviii + 541.
- BOULENGER, G. A. 1920. A monograph of the South Asian, Papuan, Melanesian and Australian Frogs of the Genus *Rana*. *Rec. Indian Mus.*, **20** : 1-126.
- CHANDA, S. K. 1992. Further note on the distribution pattern of Amphibia in North-east India. *J. Bengal Nat. Hist. Soc.*, New series **11** No 1 : 25-33.
- CHANDA, S.K. 1994. Anuran (Amphibia) Fauna of North-east India, *Mem. Zool. Surv. India*, vol. **18** No. 2 : 1-143.
- INGER, R. F. And DUTTA, S. K. 1986. An overview of the amphibian fauna of India, *J. Bombay nat. Hist. Soc.*, **83** (Supplement) : 135-146.
- SINGH, KH. S. 1977. Newts of Manipur, *Science Report*, **14** (11) : 721-722.

FISHES

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INTRODUCTION

Manipur is one of the fascinating and interesting state in India owing to its diverse ichthyofauna which occurs in varied habitat. In the middle of the parallel rows of hills with a elevation from 700 to 2000 metres above the sea level, there is a evergreen oval shaped valley. The fertile valley is watered by a number of winding rivers originated from the high hills and dotted with sparkling lakes.

The fish fauna of Manipur consists of Assamese, endemic and Burmese elements. The Assamese elements are observed in the southern part of the Brahmaputra Drainage system while endemic and Burmese elements are observed in the eastern part including the valley which is drained by the Chindwin Drainage system.

Chaudhuri (1912) described a new loach, *Noemacheilus manipurensis* sp. nov. from Manipur. Hora (1921) listed 12 species from Loktak Lake, 29 species from sluggish stream in Manipur valley, 18 species from streams with rocky bed in the southern watershed of the Naga hills and 17 species from stream with rocky bed in the northern watershed of the Naga hills. Altogether Hora (1921) recorded 56 species from this region. Hora and Mukherjee (1935) mentioned that in the fish fauna of Naga hills, representative of both Assamese and Burmese element in almost equal proportion exists. In their observation they have listed 44 species mainly from Brahmaputra and Chindwin drainage. Hora (1936) on his further observation of the fishes of Naga hills, Manipur state (mainly Tamenglong district) enlisted fishes

from the following localities, namely, Zekwara—2 sp., Karong—1 sp., Laimatak River—5 sp., Irang River—6 sp., Khathalo stream near Nangha—3 sp., Barak River—3 sp., Makru River—3 sp., Menon (1952) worked on the fishes collected about 30 miles radius of imphal from Kanglatongbi, Imphal and Water Pools and streams on Imphal-Pallel Road and listed 19 species under 9 families. Menon (1954) on his further observation on the fish fauna of Manipur, listed 63 species from Loktak Lake, Imphal river and Barak River respectively. Datta, Karmakar and Laishram (1984) described *Acrossocheilus manipurensis* sp. nov. from Taret hill stream, Saibol, 20 kms east of Tengnoupal, Manipur. Viswanath and Tombhi Singh (1985) described 36 species of fishes from Tengnoupal district with 9 new records from Manipur viz., *Anguilla bengalensis bengalensis* (Gray), *Esomus danricus* (Hamilton), *Barilius gatensis* (Valenciennes), *B. barna* (Hamilton), *Accrossocheilus hexagonolepis* (McClelland), *Aorichthys aor* (Hamilton), *Eutropüchthys vacha* (Hamilton), *Bagarius bagarius* (Hamilton) and *Glossogobius giuris* (Hamilton). Viswanath and Tombi Singh (1986) described a new species of the Genus *Puntius* (*Puntius jayarami* sp. nov.) from Manipur. The specimens were collected from Chakpi stream (a tributary of Imphal River). Viswanath and Tombi Singh (1986) further recorded *Mystus microphthalmus* (Day) first time from India. The authors collected six specimens of the species at the confluence of Manipur River and Chakpi River. Barman (1987) described a new cyprinid fish of the genus *Danio* (*Danio manipurensis* sp.

nov.) from Manipur. Viswanath et al (1987) recorded *Garra gravelyi* (Annandale) first time from India and *Garra kempfi* Hora first time from Manipur respectively. Viswanath and Tombi Singh (1987) gave an account of 17 endemic fishes from Manipur. Out of these, 7 are exclusively found in the potential boundry of Manipur. They are mostly found in the Chindwin System and absent in Brahmaputra system of Manipur. Viswanath and Sarojnolini (1988) described a new Cyprinid fish, *Garra manipurensis* from the confluence of the Chakpi and Manipur river, Manipur. Tilak and Hussain (1989) described a new cyprinid *Osteobrama brevipectoralis* from Manipur with remarks on the systematic position of the genus *Osteobrama* Heeket. But later Talwar and Jhingran (1991) merged this species with *Osteobrama belangeri* (Valenciennes). Tilak and Jain 1989 (1990) described a new rasborinae fish *Esomus manipurensis* from Manipur. But Talwar and Jhingran (1991) merged this species with *Esomus danricus* (Hamilton). Tilak and Hussain (1990) further described a new loach, *Nemacheilus chindwinicus* sp. nov. from Manipur, India with notes on the systematic status of the genus *Nemacheilus* and the sub-family Nemocheilinae. Anal and Anal (1991) studied on the ichthyofauna of Chakpi river, Chandel district, Manipur. The analysis revealed the presence of 39 species belonging to 18 genera and 7 families. Nirmala Devi and Vaiphei (1991) listed 45 species of fish from Loktak lake belonging to 28 genera and 12 families.

The present work includes a large number of fish collections recently made from three extensive field surveys (Dr. P. Krishnamurthy and party-1991, Dr. T. Roy and party-1992 and Dr. A. K. Karmakar and party-1993) by Z.S.I. survey parties; fish specimens received from Dr. W. Viswanath Singh, Manipur University; earlier identified collection available in National Zoological Collection (Collection mainly made by Drs. S. L. Hora, B. Prashad and B. N. Chopra, M. L. Roonwal, A. G. K. Menon). During the preparation of this faunal work, we have also made use of all the earlier informations available in the literature in addition to the study of fish material.

The present systematic list of the fishes of Manipur includes 9 orders 24 families 64 genera and 141 species of which 10 species under 9 genera are recorded first time from Manipur. In addition 4 species under 4 genera are recorded for the first time from India.

An attempt has been made in this present study to provide an upto date classification, nomenclature—both scientific and local names, details of material studied, size-ranges, distributional pattern, fishery information along with a species identification key under each genera. A detailed map of Manipur showing drainage system and collecting stations has also been included.

PHYSIOGRAPHY

The state of Manipur lies on the eastern frontier of India with an area of 22,356 sq.km. consisting of a vast plain valley covering about 1920 sq.km. It has a Kaleidoscopic landscape, undulating blue green hills with lush undergrowth interspersed with cascading rapids and dotted with exotic flowers. Manipur has an unrivalled scenic beauty, beautiful landscape with rich flora and fauna.

The state of Manipur has common boundaries with Nagaland in the north, Assam in the west, Myanmar in the east and both Mizoram and Myanmar in the south. It has eight districts namely, Imphal, Thoubal, Bishenpur, Ukhrul, Senapati, Churachandpur, Chandel and Tamenglong, and Jiribam Sub Division.

Imphal, a mini-metropolis, the capital of Manipur and head quarters of Imphal district, lies in the centre of oval shaped valley. According to legends, it is one of the ancient towns of Indian Sub-continent and was in existence circa 300 B.C.

Thoubal district lies also in the oval valley bordering Imphal, Bishenpur and Chandel districts respectively. Bishenpur is a picturesque valley district at the foothills that roll down to the valley. The Loktak lake, the largest freshwater lake in the North East India with small islands in the centre of the vast sheet of sparkling water and

Keibul Lamjao National Park, the only natural habitat of the Browantlered deers, the most threatend species in the entire Indian subcontinent, situated in this district.

Ukhrul, the head quarters of Ukhrul district, situated 2020 metres above the M.S.L. and is the highest station in Manipur. The Siroi Kasam Range stretches from north to south in Ukhrul district is one of the most strikingly beautiful ranges. This district has a common border with Nagaland in the north and Myanmar in the east. The Siroi Lily grows only in the Siroi hills. The Kangkhui cave is a remarkable limestone cave in Ukhrul district.

The Senapati district has a common border with Nagaland, Senapati being the head quarters of it. Mao is an attractive hill station, the border town and is halfway between Imphal and Dimapur. Imphal river flows from north to south of this district almost equally dividing it into two halves.

Churachandpur district is situated at the south-west corner of Manipur, having a common border with Assam, Mizoram and Myanmar. Khuga valley along with Khuga river is the main attraction of this district. The Tonglon cave, 32 kms from Churachandpur is a natural precipice cave.

Chandel district has a vast area measuring 3375 sq.km. This district is bordering with Myanmar in the east and south, Ukhrul district in the north and Churachandpur district in the west. In the Chandel district there are many rivers, namely, Chakpi, Kana, Lokchao, Taretlok, Maha etc.

Tamenglong, the home of Kabui Nagas known as Rongmeis, is known for its deep gorges, mysterious caves, splendid waterfalls, exotic orchids and oranges. The Tharon cave, 45 kms from Tamenglong is long, deep and large.

Jiribam Sub-Division is on the western end of Manipur bordering Assam by Barak and Jiri River. It is 225 kms from Imphal on New Cachhar Road, which is interesting for its changing scenario as one moves from the cool of Manipur towards the heat of Cachhar plains.

DRAINAGE SYSTEM

The fertile, evergreen, oval shaped valley is watered by a number of rivers and rivulets originating from the high hills and dotted with sparkling lakes. The lowest portion of Manipur state is in the southern half of the valley. Almost all the lakes are found in this region. The Loktak lake, the largest freshwater lake in North Eastern India having an innundated area of about 28,000 hectares, is one of the greatest fisheries wealth of Manipur. Besides, there are some other important lakes like pumlen, Ikop, Waithou etc.

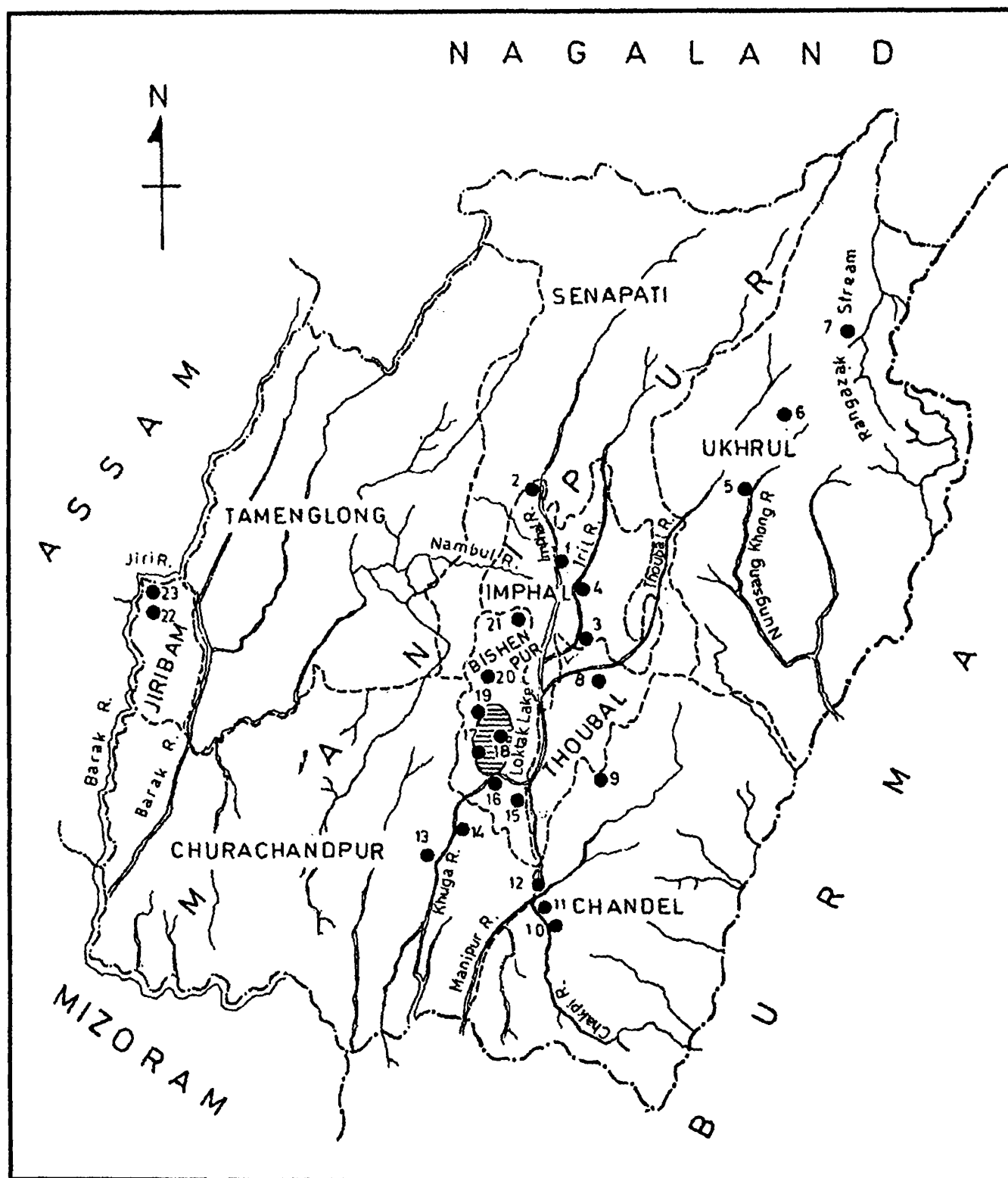
The major river systems can be divided as (i) The Barak and tributaries—Irang, Leimatak, Maklong, Maku and Jiri (ii) The Imphal and tributaries—Iril, Thoubal, Heirol, Nampul, Khuga and Chakpi and (iii) the cold water streams—Rangazek, Nungsang khong etc.

In addition to these, there are a number of domestic, community tanks, water logged bodies and more than 30,000 hectares of low lying paddy fields where fishes are available.

The Imphal river is the main drainage outlet from the valley. The tributaries originating from the hill ranges on the north, north east and north west join the Imphal river in the course through the valley. The confluent is then named as the Manipur river which joins the Chindwin river in Myanmar. The Chakpi river originates from Vumku canal and Laiong near Tengnoupal and then flows in between Anal Khulen and Jang kelchung hill. Two important rivulets, viz. Ningtungjang and Challonglapal, collect water from different sides of the hills and join Chakpi river near Ducho. Another small stream called Tujang, originates from southern part of the Chandel district join Chakpi river near Salluk village. The Chakpi river falls in the Imphal river near Serou. Many rare species of fish are migrated from Chindwin and Irabati river systems of Myanmar in to Imphal river at Manipur.

Abbreviations used

- (i) A. K. K.—A. K. Karmakar
- (ii) T. R.—T. Roy
- (iii) P.K.—P. Krishnamurthy



Map of Manipur showing drainage pattern and collecting stations

LIST OF COLLECTING STATIONS

1. Imphal (Imphal river and fish markets).
2. Sekmai river at Sekmai, Dist. Imphal.
3. Waithou village, 15 kms south of Imphal.
4. Iril river, 8 kms west of Imphal.
5. Nung Sung Kong stream, 20 kms south of Ukhrul.
6. Hung dung village, 6 kms north of Ukhrul.
7. Rangazak stream, 15 kms north of Ukhrul.
8. Thoubal, Dist.—Thoubal.
9. Pallel, Dist.—Chandel.
10. Chakpi river at Chakpikarang, 13 kms south of Sugnu.
11. Serou village, 11 kms south of Sugnu.
12. Chakpi river at Nungpan, 9 kms south of Sugnu.
13. Churachandpur, Dist.—Churachandpur.
14. Khuga river, 5 kms east of Churachandpur.
15. Ithai barage, Dist.—Bishenpur.
16. Keibul Lamjao Game Sanctuary.
17. Loktak lake at Takmu.
18. Loktak lake at Thanga.
19. Loktak lake at Ningthoukhong.
20. Bishenpur.
21. Nambal, Dist.—Bishenpur.
22. Fish farms at Jiribam.
23. Jiri river at Gopalthal village, 4 kms north of Jiribam.

SYSTEMATIC LIST OF FISHES

	Local Name
Class	PISCES
Subclass	TELEOSTOMI
Order	ANGUILLIFORMES
Family	ANGUILLIDAE
1. <i>Anguilla bengalensisbengalensis</i> (Gray)	Ngaril Laina
Family	MORINGUIDAE
+2. <i>Moringua raitabarua</i> (Hamilton)	—

Order	OSTEOGLOSSIFORMES
Family	NOTOPTERIDAE
3. <i>Notopterus notopterus</i> (Pallas)	Kandla
Order	CYPRINIFORMES
Family	CYPRINIDAE
Subfamily	CULTRINAE
4. <i>Chela cachius</i> (Hamilton)	—
*5. <i>C. laubuca</i> (Hamilton)	—
6. <i>Salmostoma bacaila</i> (Hamilton)	—
+7. <i>S. boopis</i> (Day)	—
8. <i>S. phulo phulo</i> (Hamilton)	—
Subfamily	HYPOPTHALMICHTHYINAE
**9. <i>Hypophthalmichthys molitrix</i> (Valenciennes)	Silver Carp
Subfamily	RASBORINAE
10. <i>Amblypharyngodon mola</i> (Hamilton)	Mukanga
11. <i>Aspidoparia morar</i> (Hamilton)	—
12. <i>Barilius barila</i> (Hamilton)	Ngawa
13. <i>B. barna</i> (Hamilton)	Ngawa
14. <i>B. bendelisis</i> (Hamilton)	-do-
15. <i>B. dogarsinghi</i> Hora	-do-
**16. <i>B. gatensis</i> (Valenciennes)	-do-
++17. <i>B. ornatus</i> Sauvage	-do-
18. <i>B. vagra</i> (Hamilton)	-do-
*19. <i>Brachydanio acuticephala</i> (Hora)	—
20. <i>Danio aequipinnatus</i> (McClelland)	—
*21. <i>D. dangila</i> (Hamilton)	—
22. <i>D. devario</i> (Hamilton)	—
*23. <i>D. manipurensis</i> Barman	—
*24. <i>D. maganensis</i> Chaudhuri	—
25. <i>Esomus danricus</i> (Hamilton)	Ngasang
**26. <i>Raiamas bola</i> (Hamilton)	Ngawa Thangung
27. <i>R. guttatus</i> (Day)	-do-
28. <i>Rasbora daniconius daniconius</i> (Hamilton)	—
29. <i>R. rasbora</i> (Hamilton)	—

Subfamily CYPRININAE

- **30. *Acrossocheilus hexagonolepis* (McClelland) —
 31. *A. manipurensis* Datta, Karmakar & Laishram —
 32. *Catla catla* (Hamilton) **Catla
 33. *Cirrhinus mrigala* (Hamilton) **Mrigal**
 **34. *C. reba* (Hamilton)
 35. *Ctenopharyngodon idella* (Valenciennes) **Grass Carp
 36. *Cyprinus carpio* var. *communis* Linnaeus **Scale carp**
 +37. *Labeo angra* (Hamilton) **Ngaton**
 38. *L. bata* (Hamilton) **-do-
 39. *L. calbasu* (Hamilton) **Ngathi
 40. *L. dero* (Hamilton) **-do-
 **41. *L. dyocheilus* (McClelland)
 42. *L. pangusia* (Hamilton) **Ngaton
 43. *L. rohita* (Hamilton) **Rou
 44. *Osteobrama belangeri* (Valenciennes) **Pengba Tharak**
 45. *O. cotio cotio* (Hamilton) **Ngaseksha Tharak**
 46. *O. cotio cunma* (Day) **-do-**
 **47. *Neolissochilus hexastichus* (McClelland)
 **48. *Puntius burmanicus* (Day)
 49. *P. chola* **Phabounga**
 50. *P. clavatus* (McClelland) —
 51. *P. conchoniis* (Hamilton) —
 52. *P. jayarami* Vishwanath & Tombi **Heikaknga**
 +53. *P. gelius* (Hamilton) —
 54. *P. phutunio* (Hamilton) **Ngakha Meingangbi**
 55. *P. sarana sarana* (Hamilton) **Nganoi, Ngahou**
 56. *P. sarana orphoides* (Valenciennes) **Ngakha
 +57. *P. shalynius* Yazdani & Talukdar —
 ++58. *P. shanensis* (Hora and Mukherjee) —

59. *P. sophore* (Hamilton) **Phaounga**

60. *P. ticto* (Hamilton) **-do-**

- **61. *Tor progeneius* (McClelland)

- *62. *T. putitora* (Hamilton) **Ngara**

- **63. *T. tor* (Gray) **Ngara**

Subfamily SCHIZOTHORACINAE

- **64. *Schizothorax richardsonii* (Gray) **Sananga**

Subfamily GARRINAE

65. *Crossocheilus burmanicus* Hora **Ngaroi**

- *66. *C. latius* (Hamilton) **Ngaroi**

- *67. *Garra gotyla* (Gray) **Ngamu sengum**

- **68. *G. gravelyi* (Annandale) **Ngamu sengum**

- **69. *G. kempfi* Hora **Ngamu sengum**

- **70. *G. lissorhynchus* (McClelland) **Nungnga**

- **71. *G. manipurensis* Vishwanath & Sarojnalini **Ngamu Sengum**

72. *G. naganensis* Hora **Nungnga**

- **73. *G. nasuta* (McClelland) **Ngamu Sengum**

- *74. *G. rupecula* (McClelland) **Nungnga**

Family PSILORHYNCHIDAE

- *75. *Psilorhynchus homaloptera* Hora & Mukherjee

Family HOMALOPTERIDAE

Subfamily NOEMACHEILINAE

76. *Noemacheilus botia* (Hamilton) **Ngatup**

- **77. *N. chindwinicus* Tilak and Hussain

78. *N. Kangjupkhulensis* Hora **Leingoiphon**

79. *N. manipurensis* Chaudhuri **-do-**

80. *N. prashadi* Hora **Leingoiphon**

81. *N. scaturigina* (McClelland) —

82. *N. sikmaiensis* Hora **Ngatup**

- *83. *N. zonalternans* (Blyth) **-do-**

Family COBITIDAE

Subfamily BOTIINAE

84. *Botia berdmorei* (Blyth) —

85. *B. dario* (Hamilton) **Ngarang**

- *86. *B. histrionica* (Blyth) **Sarengkhoibi**

- Subfamily COBITINAE
87. *Acanthopthalmus pangia* (Hamilton) **Nganap**
88. *Lepidocephalus berdmorei* (Blyth) **Ngakrichou**
- +89. *L. caudofurcatus* Tilak & Hussain —
90. *L. guntea* (Hamilton) **Ngakijou**
- **91. *L. irrorata* Hora **Pat-Ngamu**
- Order SILURIFORMES
- Family BAGRIDAE
- **92. *Acrichthys aor* (Hamilton) **Ngachou**
93. *Batasio tengara* (Hamilton) —
- **94. *Mystus armatus* (Day) —
95. *M. bleekeri* (Day) **Ngashep**
- **96. *M. microphthalmus* (Day) **Ngara**
- **97. *M. tengara* (Hamilton) —
- Family SILURIDAE
- *98. *Ompok bimaculatus* (Bloch) **Ngaton**
- **99. *Silurus berdmorei* (Blyth) —
- **100. *Wallago attu* (Bloch) **Sareng**
- Family SCHILBEIDAE
- +101. *Ailia punctata* (Day) —
- +102. *Clupisoma prateri* Hora —
- **103. *Eutropiichthys vacha* (Hamilton) **Ngahei**
- Family AMBLYCIPITIDAE
- *104. *Amblyceps mangois* (Hamilton) —
- Family SISORIDAE
- **105. *Bagarius bagarius* (Hamilton) **Ngaren**
- **106. *Conta conta* (Hamilton)
- **107. *Erethistes pussilus* Muller & Troschel
- **108. *Exostoma labiatum* (McClelland)
109. *Gagata cenia* (Hamilton) **Ngarang**
110. *G. gagata* (Hamilton) —
- **111. *Glyptothorax pectinopterus* (McClelland) **Ngapang**
- *112. *G. platypogonoides* (Bleeker) **Ngapang**
- *113. *G. sinanse manipurensis* Menon **Ngapang**
114. *G. talchitta* (Hamilton) **Ngapang**
115. *G. trilineatus* Blyth **Ngapang**
- +116. *Nangra viridescens* (Hamilton)
117. *Pseudecheneis sulcatus* (McClelland)
- Family CLARIIDAE
118. *Clarias batrachus* (Linnaeus) **Ngakra**
- Family HETEROPNEUSTIDAE
119. *Heteropneustes fossilis* (Bloch) **Ngachik**
- Order ATHERINIFORMES
- Family CYPRINODONTIDAE
120. *Aplocheilus panchax* (Hamilton)
- Order CHANNIFORMES
- Family CHANNIDAE
- **121. *Channa marulius* (Hamilton) **Ngamuporom**
122. *C. orientalis* (Bloch & Schneider) **Mitei Ngamu**
123. *C. punctatus* (Bloch) **Ngamu bogra**
- +124. *C. stewartii* (Playfair)
- *125. *C. striatus* (Bloch) **Ngamuporam**
- Order SYNBRANCHIFORMES
- Family SYNBRANCHIDAE
- *126. *Monopterus albus* (Zuiew) **Ngaprum**
- Order PERCIFORMES
- Family CHANDIDAE
127. *Chanda baculis* (Hamilton) **Ngamhai**
128. *C. nama* (Hamilton) **Ngamhai**
129. *C. ranga* (Hamilton) **Ngamhai**
- Family NANDIDAE
130. *Badis badis* (Hamilton) **Ngamhai**
- Family CICHLIDAE
- **131. *Oreochromis mossambica* (Peters) **Tunghanbi**
- Family MUGILIDAE
132. *Sicamugil cascasia* (Hamilton)
- Family GOBIIDAE
133. *Glossogobius giuris* (Hamilton) **Nailonnga**
- Family ANABANTIDAE
134. *Anabas testudineus* (Bloch) **Uikabi**

Family BELONTIDAE

135. *Colisa fasciatus* (Bloch) Ngapemma++136. *C. labiosus* (Day) —137. *C. sota* (Hamilton) Phetin

Order MASTACEMBELIFORMES

Family MASTACEMBELIDAE

**138. *Macrogathus aral* (Bloch & Schneider)139. *Mastacembelus armatus* (Lacepede)

Ngaril

++140. *M. caudiocellatus* Boulenger —141. *M. pancalus* (Hamilton) Ngaril

* Recorded from the Zoological Survey of India (H.Q) registered collection.

** Recorded from literature.

+ Recorded for the first time from Manipur

++ Recorded for the first time from India.

SYSTEMATIC ACCOUNT

Class PISCES

Subclass TELEOSTOMI

Order ANGUILLIFORMES

Family ANGUILLIDAE

Genus *Anguilla* Shaw, 18031803. *Anguilla* Shaw, *General Zoology*, 4 : 15 (type-species : *Anguilla vulgaris* Shaw)

Eel like fishes, anteriorly cylindrical with minute embedded scales. Vertical gill opening; gill slits near base of pectoral fin. Dorsal fin commences far behind gill openings. Pectoral fins well developed. Dorsal, anal and caudal fins confluent. Lateral line present.

1. *Anguilla bengalensis bengalensis* (Gray)1831. *Muraena bengalensis* Gray, *Illust. Indian Zool.* : pl. 95, fig. 5 (type-locality : Ganges river).1991. *Anguilla bengalensis bengalensis* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 74-75.

Material examined : (i) 2 exs., 145-200 mm, Jiri river at Jiribam, Coll. W. Vishwanath, December '89.

Geographical Distribution : India : throughout.*Elsewhere* : Pakistan; Sri Lanka; Myanmar and the East Indies.

Fishery Information : It attains a length of 1200 mm; common to about 800 mm. This is the most common eel in Indian inland waters and of considerable commercial value; and is supposed to have special nutritional importance.

Family MORINGUIDAE

Genus *Moringua* Gray, 18311831. *Moringa* Gray, *Zool. Miscell* : 9 (type-species : *Muraena linearis* Gray = *Muraena raitaborua* Hamilton-Buchanan).

Body very long and slender; trunk considerably longer than tail. Gill openings narrow and long. Cleft of the mouth narrow; teeth in single row on jaws. Dorsal and anal fins membranous, inserted a short distance behind vertical line through anus; both confluent with caudal fin. Vent far behind mid-length of the body.

2. *Moringua raitabarua* (Hamilton)1822. *Muraena raitabarua* Hamilton-Buchanan, *Fishes of Ganges* : 25, 364 (type-locality : Ganges river, India).1991. *Moringua raitabarua* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 77-78.

Material examined : (i) 1 ex., 445 mm, Pond at Nampal, Coll. T. R. & party, 26.ii.92 (ii) 1 ex., 350 mm, Moirang Fish Market, Coll. P. K. & party, 1.xii.91.

Geographical Distribution : India : Gangetic estuary, West Bengal (First record from Manipur).*Elsewhere* : Bangla Desh.

Fishery Information : This eel attains a length of about 450 mm and is consumed by certain group of people in West Bengal and Manipur.

Order OSTEGLLOSSIFORMES

Family NOTOPTERIDAE

Genus *Notopterus* Lacepede, 18001800. *Notopterus* Lacepede, *Hist. nat. Poiss.*, 2 : 189 (type-species : *Notopterus kapirat* Lacepede = *Gymnotus notopterus* Pallas).

Body broad, strongly compressed, caudal portion long and tapering. Abdominal edge serrated, with about 28 scutes. Head compressed with large membranous opercular flap. Mouth opening wide; teeth small on jaws, also on palate and tongue. Dorsal fin short, inserted near middle of back with seven to ten rays. Anal fin very long with 100 to 135 rays, confluent with small caudal fin. Pelvic fins rudimentary.

3. *Notopterus notopterus* (Pallas)

1769. *Gymnotus notopterus* Pallas, *Specil. Zool.*, 7 : 40, pl. 6, fig. 2 (type-locality : Indian Ocean).
1991. *Notopterus notopterus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 64-65, fig. 25.

Material examined : (i) 3 exs., 8-103 mm, Moirang Market, Coll. P. K. & party, 24.xi.91 (ii) 1 ex., 200 mm, Thangal Market, Imphal, Coll. P. K. & party, 22.xi.91 (iii) 2 exs., 95-97 mm, Bishenpur, Coll. P. K. & party, 27.xi.91 (iv) 2 exs., 75-130 mm, Takmu Lake, Coll. T. R. & party, 29.ii.92 (v) 5 exs., 90-99 mm, Keibul Lamjao sanctuary, Coll. T. R. & party, 1.iii.92 (vi) 1 ex., 126 mm, Thoubal Fishing Centre, Coll. P. K. & party, 29.xi.91 (vii) 2 exs., 45-70 mm, Thanga village, 50 kms from Imphal, Coll. P. K. & party, 28.xi.91 (viii) 1 ex., 175 mm, Khutikhong Fish Farm at Jiribam, A. K. K. & party, 18.iii.93 (ix) 1 ex., 210 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (x) 2 exs., 122-130 mm, Thangal Fish Market, Imphal, Coll. A.K.K. & party 5.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Nepal; Bangla Desh; Myanmar; Thailand; Malaya and Indonesia.

Fishery Information : Generally it attains a length of about 450 mm. Due to its carnivorous nature, this fish can only be cultured in wild waters or in fattening ponds where large fishes are only present. Commercially important species, consumed both in fresh and dried state.

Order CYPRINIFORMES

Family CYPRINIDAE

Subfamily CULTRINAE

Genus *Chela* Hamilton-Buchanan, 1822

1822. *Chela* Hamilton-Buchanan, *Fishes of Ganges* : 258, 383 (Type-species : *Cyprinus (Chela) cachius* Hamilton-Buchanan).

Body elongate, strongly compressed, with cutting abdominal edge. Mouth directed obliquely upward, cleft extending to below anterior margin of the eye. Symphyseal knob absent on the lower jaw. Dorsal fin with, 9 to 11, anal fin with 17 to 25 rays. Outer ray of pelvic fin elongated. Lateral line curved downwards, with 34 to 68 scales.

Key to the species of Genus *Chela*

Pectoral fin not reaching anal fin. Pelvic fin with an elongated ray extending to middle or end of anal fin base. Lateral line scales 51 to 68 *C. cachius*

Pectoral fin reaching anal fin. Pelvic fin with elongated ray ends before anal fin base. Lateral line scales 34 to 37 *C. laubuca*

4. *Chela cachius* (Hamilton)

1822. *Cyprinus (Chela) cachius* Hamilton-Buchanan, *Fishes of Ganges* : 259, 384 (type-locality : Ganga river about commencement of delta).
1991. *Chela cachius* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 313-314, fig. 111.

Material examined : (i) 4 exs., 55-66 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India.

Elsewhere : Pakistan; Bangla Desh and Myanmar.

Fishery Information : It attains to a size of about 70 mm and due to its beautiful colouration, it is used as an ornamental fish in the aquaria.

Genus *Salmostoma* Swainson, 1839

1839. *Salmostoma* Swainson, *The natural history of fishes*, 2 : 184 (type-species : *Cyprinus bacaila* Hamilton-Buchanan).

Body elongate and laterally compressed. Abdomen keeled below pectoral fin to vent, keel not hardened. Mouth oblique, its cleft extending to anterior margin of eye or slightly beyond. Lower jaw often with a symphyseal knob. Dorsal fin short, with 9 to 10 and anal fin with 14 to 20 rays. Outer ray of pelvic fin usually not elongated. Lateral line gently curved downwards above pectoral fin, with 38 to 112 scales.

Key to the species of Genus *Salmostoma*

1. Lateral line scales above 70 2
 Lateral line scales below 70 3
2. Anal fin with 11 to 13 branched rays
 *S. bacaila*
 Anal fin with 16 to 18 branched rays
 *S. phulo phulo*
3. Lateral line scales 38-40. Dorsal fin inserted in advance of anal fin. Anal fin rays 14 to 15
 *S. boopis*

6. *Salmostoma bacaila* (Hamilton)

1822. *Cyprinus bacaila* Hamilton-Buchanan, *Fishes of Ganges*, : 265, 384, pl. 8, fig. 76 (type-locality : freshwater rivers of Gangetic provinces).
1991. *Salmostoma bacaila* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 321-322, fig. 115.

Material examined : (i) 1 ex., 128 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & Party, 19.iii.93.

Geographical Distribution : India : Northern India (Ganga-Brahmaputra drainages) to the Mahanadi drainage (Orissa).

Elsewhere : Bangla Desh; and Nepal.

Fishery Information : It attains a length of about 180 mm and is of little interest to fisheries. It is surface feeder and regarded as a useful larivorous fish.

7. *Salmostoma boopis* (Day)

1873. *Chela boopis*, *Proc. Zool. Soc. Lond.*, 708 (type-locality : South Canara).
1991. *Salmostoma boopis* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 322.

Material examined : (i) 1 ex., 80 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93 (ii) 1 ex., 88 mm, Pachau Fish Breeding Farm, 3 kms south of P.W.D.I.B., Jiribam, Coll. A.K.K. & party, 18.iii.93.

Geographical Distribution : India : Western Ghats-South Canara and Poona (new record from Manipur).

Fishery Information : This species attains a length of about 120 mm and is of no interest to fisheries.

8. *Salmostoma phulo phulo* (Hamilton)

1822. *Cyprinus phulo* Hamilton-Buchanan, *Fishes of Ganges*, : 262, 384 (type-locality : north-eastern parts of Bengal).
1968. *Salmostoma phulo phulo* : Banaresou, *Rev. roum. Biol. (zool.)*, 13 (1) : 5, fig. 2.

Material examined : (1) 4 exs., 65-90 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : Gangetic and Brahmaputra drainages.

Elsewhere : Bangla Desh.

Fishery Information : It attains a length of about 120 mm and is of no interest to fisheries.

Subfamily BASBORINAE

Genus *Amblypharyngodon* Bleeker, 1860

1860. *Amblypharyngodon* Bleeker, *Natuurk Tijdschr. Ned. Indie*, 20 : 433 (type-species : *Cyprinus mola* Hamilton-Buchanan).

Body rather elongate and somewhat compressed. Abdomen rounded. Mouth somewhat superior, upper lip absent. No barbels. Dorsal fin very short, inserted slightly behind pelvic fin base, with 7 branched rays. Anal fin short, with 5 to 6 branched rays. Lateral line incomplete, 55 to 75 scales in lateral series.

10. *Amblypharyngodon mola* (Hamilton)

1822. *Cyprinus mola* Hamilton-Buchanan, *Fishes of Ganges*, : 334, 392, pl. 38, fig. 92 (type-locality : ponds and rivers of Gangetic provinces).

1991. *Amblypharyngodon mola* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 338.

Material examined : 10 exs., 47-65 mm, Imphal Fish Market, Coll. P.K. & party, 25.xi.91 (ii) 3 exs., 50-55 mm, Thangal Market, Imphal, Coll. P. K. & party, 22.xi.91 (iii) 9 exs., 47-70 mm, Bishenpur, Coll. P.K. & party, 27.xi.91 (iv) 3 exs., 52-64 mm, Nightingam, 35 kms from Imphal, Coll. P.K. & party, 26.xi.91 (v) 2 exs., 61-63 mm, Takmu Lake, Coll. T.R. & party, 29.ii.92 (vi) 1 ex., 45 mm, Khordak River, West of Keibul Lamjao Sanctuary, Coll. T.R. & party, 2.iii.92 (vii) 16 exs., 45-70 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xi.91 (viii) 4 exs., 45-70 mm, Thanga village, 50 kms from Imphal, Coll. P.K. & party, 28.xi.91 (ix) 1 ex., 65 mm, Khuga River, 5 kms east of Churachandpur, Coll. T.R. & party, 9.iii.92 (x) 1 ex., 52 mm, Loktak Lake, Coll. T.R. & party, 27.ii.92 (xi) 1 ex., 55 mm, Floating Sanctuary, Keibul, Coll. T.R. & party, 3.iii.92 (xii) 3 exs., Withou village, 15 kms from Imphal; Coll. P.K. & party, 23.xi.91 (xiii) 4 exs., 53-64 mm, Moirang Market, Coll. P.K. & party, 24.xi.91 (xiv) 4 exs., 60-68 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 18.iii.93 (xv) 22 exs., 35-65 mm, Khutikhong Fish Farm at Jiribam, Coll. A.K.K. & party, 18.iii.93 (xvi) 28 exs., 28-60 mm, Pachau Fish Breeding Farm, 3 kms south of P.W.D.I.B., Jiribam, Coll. A.K.K. & party, 18.iii.93 (xvii) 3 exs., 50-58 mm, Khuga River near Churachandpur (Market Coll.), Coll. A.K.K. & party, 10.iii.93 (xviii) 4 exs., 38-45 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : throughout the country.

Elsewhere : Bangla Desh; Myanmar; Pakistan.

Fishery Information : It attains a length of 100 mm and used as a food fish in some areas specially Eastern India.

Genus *Aspidoparia* Heckel, 1843

1843. *Aspidoparia* Heckel, *Abbild. Fenzl. Thiere Pill Syriens Fische* : 186 (type-species : *Aspidoparia sardina* Heckel = *Cyprinus morar* Hamilton-Buchanan).

Body elongate and subcylindrical; abdomen rounded. Mouth small and inferior. Lower jaw

without a lip but with a sharp crescentic bony edge. No barbels. Dorsal fin inserted posterior to pelvic fin, with 9 to 10 rays; anal fin with 9 to 12 rays. Lateral line greatly curved, running in the lower half of caudal peduncle with 38 to 60 scales.

11. *Aspidoparia morar* (Hamilton)

1822. *Cyprinus morar* Hamilton-Buchanan, *Fishes of Ganges*, : 264, 384, pl. 31, fig. 75 (type-locality : Yamuna river and Tista river).

1991. *Aspidoparia morar* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 340, fig. 119.

Material examined : (i) 1 ex., 116 mm, Jiri river at Jiribam, Coll. W. Vishwanath, 1989.

Geographical Distribution : India : throughout northern part.

Elsewhere : Iran; Pakistan; Nepal; Bangla Desh; Myanmar and Thailand.

Fishery Information : It attains a length of about 175 mm and of no interest to fisheries.

Genus *Barilius* Hamilton-Buchanan, 1822

1822. *Barilius* Hamilton-Buchanan, *Fishes of Ganges*, : 266, 384 (type-species : *Cyprinus barila* Hamilton-Buchanan).

Body more or less elongated, laterally compressed, with rounded abdomen. Mouth moderate and terminal; maxilla extends to below or slightly beyond anterior margin of eye. Barbels 1 or 2 pairs or absent. Dorsal fin inserted opposite interspace between pelvic and anal fin, often extending over anal fin. Dorsal fin with 9 to 13 and anal fin with 9 to 17 rays. Lateral line concave and complete with 38 to 75 scales. Body usually with dark spots or bands.

Key to the species of Genus *Barilius*

1. Barbels present 2
Barbels absent 5
2. Barbels 4 3
Barbels 2 4
3. Anal fin short with 9-11 rays, each scale with a black spot *B. bendelisis*

- Anal fin long with 13-15 rays, 10 vertical bars *B. vagra*
- 4. Lateral line scales 38-39
..... *B. dogarsinghi*
- Lateral line scales 43-46 *B. barila*
- 5. Body with 7-9 vertical bars *B. barma*
- Body with more than 12 vertical bars 6
- 6. Lateral line scales 39-41 *B. gatensis*
- Lateral line scales 45 *B. ornatus*

12. *Barilius barila* (Hamilton)

1822. *Cyprinus (Barilius) barila* Hamilton-Buchanan, *Fishes of Ganges*, : 267, 384 (type-locality, rivers of northern Bengal).
1991. *Barilius barila* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 343-344.

Material examined : 13 exs., 110-140 mm, Chakpi river at Chakpikarang, 13 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93.

Geographical Distribution : India : Jammu and Kashmir, Delhi, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Assam, Manipur and Orissa.

Elsewhere : Nepal; Bangla Desh and Myanmar.

Fishery Information : It attains a length of 110 mm. Like other small species of *Barilius*, it is used by the fishermen as a bait on hooks for bigger fishes.

13. *Barilius barna* (Hamilton)

1822. *Cyprinus (Barilius) barna* Hamilton-Buchanan, *Fishes of Ganges*, : 268, 384 (type-locality : Jamuna river and Brahmaputra river).
1991. *Barilius barna* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 344-345.

Material examined : (i) 1 ex., 68 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : Ganga and Brahmaputra river system, Mahanadi.

Elsewhere : Nepal; Bangla Desh and Myanmar.

Fishery Information : It attains a length of 80 mm and is of no interest to fisheries.

14. *Barilius bendelisis* (Hamilton)

1807. *Cyprinus bendelisis* Hamilton-Buchanan, *Journey in Mysore*, 3 : 345, pl. 32 (type-locality : Vedawati stream, headwaters of Krishna river near Heriuru, Mysore).
1991. *Barilius bendelisis* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 346-347.

Material examined : (i) 3 exs., 55-118 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93 (ii) 1 ex., 80 mm, Chakpi river at Chakpikarang, 13 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93.

Geographical Distribution : India.

Elsewhere : Pakistan; Nepal; Bangla Desh and Sri Lanka.

Fishery Information : It attains a length of 160 mm, is one of the principal commercial hill stream fishes.

15. *Barilius dogarsinghi* Hora

1921. *Barilius dogarsinghi* Hora, *Rec. Indian Mus.*, 22(3) : 191, fig. 3 (type-locality : near Chanderkhong, Manipur).
1991. *Barilius dogarsinghi* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 348.

Material examined : (i) 1 ex., 50 mm, Chakpi river at Nungpan, 9 kms from I.B., Sugnu, Coll. A.K.K. and party, 16.iii.93.

Geographical Distribution : India : Manipur.

Fishery Information : It attains a length of 85 mm, is of no interest to fisheries.

17. *Barilius ornatus* Sauvage

1893. *Barilius ornatus* (Nec. Sauvage) Boulenger, *Ann. Mag. nat. Hist.*, (6) 12 : 203 (South Shan States, Myanmar).
1981. *Barilius ornatus* : Jayaram, *Freshwater Fishes of India* : 89-90.

Material examined : (i) 4 exs., 103-128 mm, Serou village, 12 kms away from Sugnu, Coll. A.K.K. & party, 16.iii.93 (ii) 16 exs., 25-40 mm, Khuga River, 2 kms away from Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93 (iii) 4 exs., 45-48 mm, Chakpi river at Chakpikarong, 13 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93.

Geographical Distribution : Myanmar; Thailand (new record from India : Manipur).

Fishery Information : It attains a length of 130 mm, is of no interest to fisheries.

18. *Barilius vagra* (Hamilton)

1822. *Cyprinus (Barilius) vagra* Hamilton-Buchanan, *Fishes of Ganges*, : 269, 385 (type-locality : Ganges river at Patna).

1991. *Barilius vagra* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 253.

Material examined : (i) 14 exs., 75-122 mm, Chakpi River at Nungpan, 9 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93.

Geographical Distribution : India : Himalayan and Sub-Himalayan rivers.

Elsewhere : Afghanistan; Pakistan; Nepal; Bangladesh and Sri Lanka.

Fishery Information : It attains a length of 130 mm and is of no interest to fisheries. However, the colour of the fish in living condition with beautiful combination of different shades, is very attractive.

Genus *Danio* Hamilton-Buchanan, 1822

1822. *Danio* Hamilton-Buchanan, *Fishes of Ganges* : 321, 390 (type-species : *Cyprinus dangila* Hamilton-Buchanan)

Body more or less elongate and compressed. Mouth anterior, small and directed obliquely upwards. Lower jaw with a symphysial knob. Maxilla extends upto anterior margin of the eye. Barbels 2 pairs, one pair or absent. Dorsal fin with 6 to 17 and anal fin with 11-20 rays. Caudal fin emarginate, lunate or forked. Lateral line complete, incomplete or absent; with 32 to 65 scales.

Key to the species of Genus *Danio*

1. Barbels absent. Lateral line scales 35-38
..... *D. devario*
- Barbels present 2
2. Lateral colour bands breaking up anteriorly to form a mottled pattern. Both pairs of barbels much longer than eye diameter .. *D. dangila*

– Lateral colour bands not breaking up anteriorly to form a mottled pattern 3

3. Several well marked and uniform lateral bands,

– Lateral line scales 34-36 .. *D. aequipinnatus*

4. A single lateral band well marked posteriorly.

– Lateral line scales 38-40 *D. naganensis*

20. *Danio aequipinnatus* (McClelland)

1839. *Perilampus aequipinnatus* McClelland, *Asiat Res.*, 19(2) : 393, pl. 60, fig. 1 (type-locality : Assam).

1991. *Danio aequipinnatus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 364-365, fig. 128.

Material examined : (i) 1 ex., 55 mm, Nung Sung Kong (stream), 20 kms south of Ukhrul, Coll. A.K.K. & party, 8.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Nepal; Sri Lanka; Bangla Desh; Myanmar and Thailand.

Fishery Information : It attains a length of about 150 mm and is a widely distributed beautiful fish of our area. This also proves to be peaceful and hardy aquarium fish.

22. *Danio devario* (Hamilton)

1822. *Cyprinus devario* Hamilton-Buchanan, *Fishes of Ganges* : 341, 393, pl. 6, fig. 94 (type-locality : rivers and ponds of Bengal).

1991. *Danio devario* : Talwar and Jhingran, *Inland fishes of India and Adjacent Countries* : 367-368, fig. 130.

Material examined : (i) 2 exs., 66-76 mm, Chakpi river at Nungpan, 9 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93 (ii) 1 ex., 75 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : northern India to the Krishna-Godavari river system.

Elsewhere : Pakistan; Nepal and Bangla Desh.

Fishery Information : This pretty fish attains a length of 100 mm and is a fairly popular aquarium fish.

Genus *Esomus* Swainson, 1839

1839. *Esomus* Swainson, *The natural history of fishes*, 2 : 185, 285 (type-species : *Esomus vittatus* Swainson = *Cyprinus danrica* Hamilton-Buchanan).

Body elongate and slender, strongly compressed. Mouth small, upwardly directed. Symphyseal knob on lower jaw absent. Barbels 2 pairs, maxillary barbels very long extending upto anal fin. Dorsal fin inserted almost above anal fin, with 6 branched rays; anal with 5 branched rays. Lateral line when present, strongly arched anteriorly and passes through the lower half of caudal peduncle, with 27 to 34 scales.

25. *Esomus danricus* (Hamilton)

1822. *Cyprinus danrica* Hamilton-Buchanan, *Fishes of Ganges*, : 325, 390, pl. 16, fig. 88 (type-locality : ponds and ditches of Bengal).

1991. *Esomus danricus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 377-378, fig. 139.

Material examined : (i) 2 exs., 64-66 mm, Takmu Lake, Coll. T.R. & party, 29.ii.92 (ii) 4 exs., 47-57 mm, Khordak River, West of Keibul Lamjao Sanctuary, Coll. T.R. & party, 2.iii.92 (iii) 1 ex., 35 mm, Thanga village, 50 km from Imphal, Coll. P.K. & party, 28.xi.91 (iv) 1 ex., 45 mm, Floating Sanctuary, Keibul, Coll. T.R. & party, 3.iii.92 (v) 3 exs., 44-52 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (vi) 7 exs., 50-55 mm, Khutikhang Fish Farm at Jiribam, Coll. A.K.K. & party, 18.iii.93 (vii) 24 exs., 50-56 mm, Fish farm at Kamalathabi, Pallel, Coll. A.K.K. & party, 15.iii.93 (viii) 7 exs., 45-53 mm, Pachau Fish Breeding Farm, 3 kms south of P.W.D.I.B., Jiribam, Coll. A.K.K. & party, 18.iii.93 (ix) 17 exs., 52—81 mm, Fish Farm at Tuibuange, 2 kms from Churachandpur Circuit House, Coll. A.K.K. & party, 11.iii.93 (x) 31 exs., 37-56 mm, Khuga river, 2 kms east of Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93 (xi) 2 exs., 50-52 mm, Khuga river near Churachandpur (Market Coll.), Coll. A.K.K. & party, 10.iii.93 (xii) 7 exs., 50-73 mm, Fish Farm, 1 km from Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Nepal; and probably also Sri Lanka and Myanmar.

Fishery Information : It attains a length of 120 mm, very active, a surface feeder, equipped with exceptionally wide pectoral fins and is an accomplished jumper.

Genus *Raiamas* Jordan, 1918

1918. *Raiamas* Jordan, *Proc. Acad. nat. Sci. Philad.*, 70 : 344 (Type-species : *Cyprinus bola* Hamilton-Buchanan).

Body elongate and laterally compressed. Head sharply pointed, its length 4.3 to 4.6 times in standard length. Mouth obliquely directed upward; very wide; maxilla extends well behind posterior margin of eye. Lower jaw with a well-developed symphyseal knob. Barbels a minute maxillary pair, or absent. Dorsal fin with 7 to 8 branched rays, devoid of any osseous ray; anal with 9 to 10 branched rays. Lateral line with 44 to 95 scales.

Key to the species of Genus *Raiamas*

1. (a) Scales small, 85 to 95 in lateral line; barbels absent in adults *R. bola*
- (b) Scales moderate, 44 to 48 in lateral line; barbels minute, a maxillary pair present, rostral pair may be absent *R. guttatus*

27. *Raiamas guttatus* (Day)

1869. *Oparius guttatus* Day, *Proc. zool. Soc. Lond.*, : 620 (type-locality : Irrawaddy river, from Prome to Mandalay, Myanmar).

1952. *Raiamas guttatus* Menon, *Rec. Indian Mus.*, 50(2) : 268.

1991. *Raiamas guttatus* Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 386.

Material examined : (i) 1 ex., 250 mm, Serou village, 12 kms away from Sugnu, Coll. A.K.K. & party, 13.iii.93 (ii) 1 ex., 90 mm, Kharungpat lake, Thoubal district, Coll. W. Vishwanath & Manoj Kumar, July 1982.

Geographical Distribution : India : Manipur.

Elsewhere : Nepal; Myanmar; Shan states; Thailand; Cambodia and Malay Peninsula.

Fishery Information : It attains a length of 250 mm and a food fish; minor fisheries interest in Manipur and Myanmar.

Genus *Rasbora* Bleeker, 1860

1860. *Rasbora* Bleeker, *Acta Soc. Sci. Indo-Neerl.*, 7 : 435 (type-species : *Cyprinus rasbora* Hamilton-Buchanan).

Body elongate, moderately deep and laterally compressed. Mouth moderate, upwardly directed, with a projecting lower jaw. Lower jaw with a symphyseal knob. Barbels usually absent. Dorsal fin inserted opposite interspace between pelvic and anal fin, with 9 to 10 soft rays, no spine. Anal fin with 7 to 8 rays. Lateral line concave, complete, 25 to 37 scales in longitudinal series.

Key to the species of Genus *Rasbora*

1. (a) Lateral line with 32 to 34 scales. A black lateral stripe along centre of body
..... *R. daniconius daniconius*
- (b) Lateral line with 28 to 31 scales. Caudal fin with well defined blackish hind-border
..... *R. rasbora*

28. *Rasbora daniconius daniconius* (Hamilton)

1822. *Cyprinus daniconius* Hamilton-Buchanan, *Fishes of Ganges*, : 327, 391, pl. 15, fig. 89 (type-locality : rivers of southern Bengal).
1981. *Rasbora daniconius daniconius* : Jayaram, *The Freshwater Fishes of India; Pakistan, Bangla Desh, Myanmar and Sri Lanka*, : 84, fig. 43.

Material examined : (i) 2 exs., 31-44 mm, Khuga river, 2 kms away from Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93
(ii) 4 exs., 28-50 mm, Fish farm at Tuibuang, 2 kms west of Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Sri Lanka; Bangla Desh; Myanmar and Mekong.

Fishery Information : It attains a length of about 100 mm and is hardy and active; not important from fisheries point of view.

29. *Rasbora rasbora* (Hamilton)

1822. *Cyprinus rasbora* Hamilton-Buchanan, *Fishes of Ganges*, : 329, 391, pl. 2, fig. 90 (type-locality : ponds of Bengal).

1991. *Rasbora rasbora* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 390, fig. 139.

Material examined : 1 ex., 80 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam; Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : Gangetic provinces, Assam, Manipur.

Elsewhere : Pakistan; Bangla Desh; Myanmar and Thailand.

Fishery Information : This species attains a length of about 130 mm and because of its beauty and hardiness, it has established itself as an aquarium fish.

Subfamily CYPRININAE**Genus *Acrossocheilus* Oshima, 1919**

1919. *Acrossocheilus* Oshima, *Ann. Carnegie Mus.*, 12 : 206 (type-species : *Gymnostomus formosanus* Oshima).

Body elongate, not very deep, compressed. Head short, broad, with several rows of horny tubercles on sides and in front of nasal below eyes. Snout obtusely rounded; mouth moderate, subterminal. Lips thick and continuous round the angle of mouth. Labial fold interrupted in the middle. Lower jaw covered by a horny covering. Four barbels. Dorsal fin inserted slightly ahead of pelvic fin, with 13 rays and a smooth spine. Anal fin with 8 rays. Lateral line complete with 22-32 large scales.

Key to the species of Genus *Acrossocheilus*

1. (a) Dorsal fin osseous and smooth with 9 branched rays. Lateral line scales 28-31, pre-dorsal scales 8 *A. hexagonolepis*
- (b) Dorsal fin osseous and denticulated with 8 branched rays. Lateral line scales 40-41, pre-dorsal scales 13 *A. manipurensis*

31. *Acrossocheilus manipurensis* Datta, Karmakar & Laishram

1984. *Acrossocheilus manipurensis* Datta, Karmakar & Laishram, *Bull. zool. Surv. India*, 6 (1-3) : 167-170, fig. 2 (type-locality : Taret hill stream, Siabol, 20 kms east of Tengnoupal, Manipur).

Material examined : 1 ex., 130 mm, Taret hill stream at Saibol, 20 kms east of Tengnoupal, Manipur, Coll. I.S. Laishram, 15.v.1981.

Geographical Distribution : Manipur, India.

Fishery Information : Not known as it is a recently described species.

Genus *Cirrhinus* Cuvier, 1817

1817. *Cirrhinus* Oken, *Isis* : 1833 (on *Les Cirrhines* Cuvier, 1817, *Regne Animale*, 2 : 193) (type-species : *Cyprinus cirrhosus* Bloch).

Body elongate; abdomen rounded. Snout depressed, often with pores. Mouth wide, lower jaw with a small symphyseal knob. Upper lip not continuous with lower lip around corners of mouth. Barbels one or two pairs, or absent. Dorsal fin inserted anterior to pelvic fins, with 10 to 19 rays, the last simple ray nonosseous and nonserrated. Anal fin with 7 to 8 rays. Lateral line complete with 35 to 45 scales.

Key to the species of Genus *Cirrhinus*

1. (a) Dorsal fin with 8 branched rays.
 - Lateral line scales 35-38 *C. reba*
- (b) Dorsal fin with 12-13 branched rays.
 - Lateral line scales 40-45 *C. mrigala*

33. *Cirrhinus mrigala* (Hamilton)

1822. *Cyprinus mrigala* Hamilton-Buchanan, *Fishes of Ganges*, : 279, 386, pl. 6, fig. 79 (type-locality : ponds and freshwater rivers of Gangetic provinces).
1981. *Cirrhinus mrigala* : Jayaram, *The Freshwater fishes of India, Pakistan, Bangla Desh, Myanmar and Sri Lanka*, : 126-127.

Material examined : 4 exs., 47-67 mm, Fish Farm at Churachandpur, 1 km away from Circuit House, Coll. A.K.K. & party, 11.iii.93.

Geographical Distribution : India : northern India from Punjab to West Bengal and Assam. Also successfully transplanted into water of peninsular India and other states for aquaculture.

Elsewhere : Pakistan; and Bangla Desh.

Fishery Information : It attains a length of about one meter and a weight of 13 kg and is an

important major carp in India and quite a game fish. A large number of intergeneric hybrids has been produced at the Central Inland Fisheries Research Institute, Barrackpore.

Genus *Cyprinus* Linnaeus, 1758

1758. *Cyprinus* Linnaeus, *Systema Naturae*, ed. 10, 1 : 320 (type-species : *Cyprinus carpio* Linnaeus)

Body robust, elongate and compressed. Abdomen rounded. Head relatively small with a bluntly rounded snout. Eyes moderate, placed on the upper half of the head. Mouth small, terminal. Barbels 2 pairs, rostral and maxillary. Dorsal fin very long, inserted opposite to pelvic fins, with 3 spines and 18 rays. Anal fin short with 3 spines and 5 rays. Scales large; lateral line with 30 to 40 scales.

36. *Cyprinus carpio* var. *communis* Linnaeus

1758. *Cyprinus carpio* Linnaeus, *Systema Naturae*, ed. 10, 1 : 320 (type-locality : Europe).
1991. *Cyprinus carpio* var *communis* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 184-186.

Material examined : (i) 2 exs., 38-67 mm, Fish Farm, 1 km away from Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93.

Geographical Distribution : Naturally found in China; Korea; Japan; Thailand; Europe; America; introduced in India for culture.

Fishery Information : It attains a length around 1 meter and a maximum 10 kg body weight. Cultivated in freshwater impoundments all over the world.

Genus *Labeo* Cuvier, 1817

1817. *Labeo* Cuvier, *Regne Animale*, 2 (ed.1) : 194 (type-species : *Cyprinus niloticus* Forsskal = *Cyprinus rufescens* Hasselquist).

Body cylindrical, elongate; abdomen rounded. Generally overhanging mouth, inferior, transverse and semicircular. Snout broadly rounded or obtusely pointed. Lips thick, covering the jaws, continuous at the angle of mouth. Barbels one or two pairs, or absent; when single pair, always

maxillary. Dorsal fin inserted anterior to pelvic fins, with 11 to 26 rays, devoid of spine. Anal fin short with 7 to 8 rays. Lateral line complete, with 36 to 85 scales.

Key to the species of Genus *Labeo*

1. Lower lip separated from isthmus by a post labial groove. Branched dorsal rays 10 to 16 2
- Lower lip not separated from isthmus by a post labial groove. Branched dorsal rays 8 to 10 4
2. Branched dorsal rays 12 to 16.....3
- Branched dorsal rays 10..... *L. angra*
3. Branched dorsal rays 12 to 13, lateral line scales 40 to 42 *L. rohita*
- Branched dorsal rays 14 to 16, lateral line scales 40 to 46 *L. calbasu*
4. No horny covering inside lower jaw
 - (a) Eyes 4.0 to 4.3 in head length ... *L. bata*
 - (b) Eyes 6.0 to 9.0 in head length *L. dyocheilus*
- A thin horny covering inside lower jaw 5
5. Snout grooved, lateral line scales 41 to 44 *L. dero*
- Snout not grooved, frontal area beset with pores. Lateral line scales 40 to 42 *L. pangusia*

+37. *Labeo angra* (Hamilton)

1822. *Cyprinus angra* Hamilton-Buchanan, *Fishes of Ganges*,: 331, 391 (type-locality : Brahmaputra river).

1991. *Labeo angra* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 198.

Material examined : (i) 4 exs., 95-130 mm, Imphal river near Imphal, Coll. W. Vishwanath, 1989 (ii) 2 exs., 102-127 mm, Iril river, Coll. A. Renubala Devi, 12.xii.92.

Geographical Distribution : India : Assam, West Bengal, Bihar, Uttar Pradesh, Punjab and Orissa (new record from Manipur).

Elsewhere : Bangla Desh; Nepal and Myanmar.

Fishery Information : It generally grows upto 220 mm in length. This species is fairly common in the Mahanadi River where it breeds during monsoon months.

Genus *Osteobrama* Heckel, 1842

1842. *Osteobrama* Heckel, in : *Russegger's Reisen in Europa, Asien und Africa, etc.* 1(1) : 1033 (type-species : *Cyprinus cotio* Hamilton-Buchanan).

Body deep and strongly compressed. Abdominal edge sharp and trenchant entirely or only from pelvic fin base to vent. Mouth small, somewhat directed upwards. Upper jaw slightly longer. Barbels 2 pairs, 1 pair or entirely absent. Dorsal fin inserted considerably behind pelvic fin, with 11 to 12 soft rays and a strong serrated spine. Anal fin with 14 to 36 rays. Lateral line complete with 42 to 80 scales.

Key to the species of Genus *Osteobrama*

1. Anal fin with less than 20 branched rays. Abdominal edge keeled throughout *O. belangeri*
- Anal fin with more than 20 branched rays. Abdominal edge keeled between pelvic and anal fins 2
2. Lateral line scales 42 to 58. Predorsal scales 18 to 24. Scales between lateral line and pelvic fin $7\frac{1}{2}$ to $9\frac{1}{2}$ *O. cotio cotio*
- Lateral line scales 57 to 70. Predorsal scales 24 to 28. Scales between lateral line and pelvic fin $10\frac{1}{2}$ to 13 *O. cotio cunma*

44. *Osteobrama belangeri* (Valenciennes)

1844. *Leuciscus belangeri* Valenciennes, *Hist. nat. Poiss*, 17 : 99 (type-locality : 'Eaux douces de Bengale').

1991. *Osteobrama belangeri* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 237-238.

Material examined : (i) 1 ex., 225 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93.

Geographical Distribution : India : Manipur.

Elsewhere : Myanmar and China.

Fishery Information : It attains a length of about 380 mm. This species is restricted to Manipur in India and is of interest to fisheries in Manipur where it is cultured.

45. *Osteobrama cotio cotio* (Hamilton)

1822. *Cyprinus cotio* Hamilton-Buchanan, *Fishes of Ganges* : 339, 393, pl. 39, fig. 93 (type-locality : ponds and ditches of Bengal).

1991. *Osteobrama cotio cotio* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 238-239.

Material examined : (i) 1 ex., 73 mm, Imphal Fish Market, P.K. & party, 25.xi.91 (ii) 1 ex., 82 mm, Bishnupur, Coll. P.K. & party, 27.xi.91 (iii) 4 exs., 76-95 mm, Keibul Lamjao Sanctuary, Coll. T. R. & party, 1.iii.92 (iv) 1 ex., 75 mm, Thanga village, 50 kms from Imphal, Coll. P.K. & party, 28.xi.91 (v) 1 ex., 97 mm, Withou village, 15 kms from Imphal, Coll. P.K. & party, 23.xi.91 (vi) 1 ex., 80 mm, Moirang Market, Coll. P.K. & party, 24.xi.91 (vii) 3 exs., 90-122 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (viii) 3 exs., 84-93 mm, Thanga village (Loktak Lake coll.), Coll. A.K.K. & party, 13.iii.93 (ix) 1 ex., 101 mm, Khuga river near Churachandpur (Market coll.), Coll. A.K.K. & party, 10.iii.93.

Geographical Distribution : India : Assam, West Bengal, Bihar, Manipur, Madhya Pradesh, Uttar Pradesh and Punjab.

Elsewhere : Pakistan and Bangla Desh.

Fishery Information : It attains a length of about 150 mm and is of no interest to fisheries.

46. *Osteobrama cotio cunma* (Day)

1878. *Rohtee cotio* (nec Hamilton-Buchanan) Day (partim). *Fishes of India* : 587, pl. 147, fig. 2.

1991. *Rohtee cotio cunma* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 239-240, fig. 82.

Material examined : (i) 2 exs., 73-90 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 13.iii.93.

Geographical Distribution : India : Manipur valley.

Elsewhere : Myanmar.

Fishery Information : It is the commonest form of *Osteobrama* in Myanmar. It attains a length of about 150 mm and is of no interest to fisheries.

Genus *Puntius* Hamilton-Buchanan, 1822

1822. *Puntius* Hamilton-Buchanan, *Fishes of Ganges* : 310, 388 (type-species : *Cyprinus sophore* Hamilton-Buchanan).

Body short or moderately elongate, often deep and slightly compressed; with rounded abdomen. Mouth terminal to inferior; lips thin, devoid of horny covering. Symphysial knob or tubercle absent. Barbels 2 pairs, 1 pair or absent. Dorsal fin short, inserted nearly opposite to pelvic fins, with 9 to 13 rays and with or without spine. Anal fin with 7 to 9 rays. Lateral line complete or incomplete, with 20 to 47 scales in longitudinal series.

Key to the species of Genus *Puntius*

1. Barbels present 2
 - Barbels absent 7
2. Two pairs of barbel 3
 - One pair of barbel 6
3. Dorsal spine as long as depth of the body. Lateral line scales 42 *P. clavatus*
 - Dorsal spine equal to or shorter than body depth. Lateral line scales less than 40 4
4. A finger like mark on caudal peduncle present 5
 - No such finger like mark on caudal peduncle. Lateral line scales 28 to 32 *P. jayarami*
5. Dorsal fin inserted nearer caudal fin base than tip of snout. Lateral line scales 36 to 38. Predorsal scales 15 to 16 *P. shanensis*
 - Dorsal fin inserted nearer tip of snout than to caudal base. Lateral line scales 26-34. Predorsal scales 11 to 12 *P. sarana sarana*
 - Dorsal fin inserted nearer to base of caudal fin than to tip of snout. Lateral line scales 28-31. Predorsal scales 10 to 11. Caudal fin with a distinctive longitudinal black marginal band on each lobe *P. sarana orphoides*

6. Scale between middle of back and lateral line 5 or $5\frac{1}{2}$. Predorsal scales 10-12. A dark block from 23-25 scales of the lateral line. A dark spot along base of first to fourth anterior dorsal ray *P. chola*
- Scales between middle of back and lateral line 4 or $4\frac{1}{2}$. Predorsal scales 10. A dull blotch before the base of caudal fin. A dull band in the centre of dorsal fin *P. burmanicus*
7. Dorsal spine serrated 8
- Dorsal spine smooth. Body depth 3.5 to 3.75 in total length. A round black blotch at the root of caudal fin *P. sophore*
8. Body without any vertical black coloured bands 9
- Body with vertical black coloured bands 11
9. Branched ray in dorsal fin 7. 6 or 7 rows of transverse scales. A horizontal blue line on body and two spots on tail *P. shalynius*
- Branched ray in dorsal fin 8. About 12 rows of transverse scales. No band on body ... 10
10. Body depth 2.4 in total length. Predorsal scales 9. Lateral line incomplete. One black spot *P. conchoni*
- Body depth 3 to 3.5 in total length. Predorsal scales 11. Lateral line incomplete. Two black spots *P. tioto*
11. L. Tr. row of scales 8/10. Body with 4 vertical black bands *P. phutunio*
- L. Tr. row of scales $3\frac{1}{2}$ /5. Body with 3 vertical black bands *P. gelius*

49. *Puntius chola* (Hamilton)

1822. *Cyprinus chola* Hamilton-Buchanan, *Fishes of Ganges*, : 321, 289 (type-locality : north eastern parts of Bengal).
1991. *Puntius chola* : Jayaram, Revision of the Genus *Puntius* Hamilton from the Indian Region. *Rec. zool. Surv. India, Occ. Paper No. 135* : 52-56.

Material examined : (i) 4 exs., 70-89 mm, Imphal Fish Market, Coll. P.K. & party, 25.xi.91 (ii) 5 exs., 82-120 mm, Moirang Market, Coll.

P.K. & party, 1.xii.91 (iii) 5 exs., 38-81 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (a) 1 exs., 90 mm, Thangal Fish Market, imphal, Coll. A.K.K. & party, 5.iii.93 (v) 2 exs., 76-78 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : throughout; Pakistan; Nepal; Bangla Desh; Myanmar and Sri Lanka.

Fishery Information : It attains length of about 120 mm and is of only minor interest to fisheries.

50. *Puntius clavatus* (McClelland)

1845. *Barbus clavatus* McClelland, *Calcutta J. nat. Hist.*, 5 : 280, pl. 21, fig. 2 (type-locality : Sikkim mountains on northern frontier of Bengal).
1991. *Puntius clavatus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 265-266.

Material examined : (i) 2 exs., 85-92 mm, Chakpi river at Chakpi Karang, Coll. W. Viswanath and Manoj Kumar, 12.xi.92.

Geographical Distribution : India : North Bengal below the himalayan foot hills, Sikkim, Manipur.

Elsewhere : Nepal; Bangla Desh and Myanmar.

Fishery Information : It attains a length of about 240 mm, is of only minor interest to fisheries.

51. *Puntius conchoni* (Hamilton)

1822. *Cyprinus conchoni* Hamilton-Buchanan, *Fishes of Ganges*, pp. 317, 389 (type-locality : ponds of north east Bengal; Kosi river and Ami river).
1991. *Puntius conchoni* : Jayaram, Revision of the Genus *Puntius* Hamilton from the Indian Region. *Rec. Zool. Surv. India, Occ. Paper No. 135* : 27-29.

Material examined : (i) 7 exs., 60-66 mm, Bishenpur, Coll. P.K. & party, 27.xi.91 (ii) 1 ex., 85 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xi.91 (iii) 5 exs., 60-83 mm, Thanga village, 50 kms from Imphal, Coll. P.K. & party, 28.xi.91 (iv) 1 ex., 78 mm, Moirang Market, Coll. P.K. & party, 1.xii.91 (v) 6 exs., 75-82 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (vi) 12 exs., 22-55 mm, Khutikhong

Fish Farm at Jiribam, Coll. A.K.K. & party, 18.iii.93 (vii) 9 exs., 30-43 mm, Pachau Fish Breeding Farm, 3 kms south of P.W.D.I.B., Jiribam, Coll. A.K.K. & party, 18.iii.93 (viii) 1 ex., 91 mm, Thangal Fish Market, Imphal, Coll. A.K.K. & party, 5.iii.93 (ix) 4 exs., 30-39 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93 (x) 1 ex., 70 mm, Khuga River, 2 kms away from Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93 (xi) 1 ex., 70 mm, Chakpi river at Chakpikarong, 13 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93.

Geographical Distribution : India : Ganga, Brahmaputra, Mahanadi and Cauvery river systems.

Elsewhere : Pakistan; Nepal and Bangla Desh.

Fishery Information : It attains a length of about 100 mm. This is one of the most important ornamental *Puntius* species and a very beautiful aquarium fish.

52. *Puntius jayarami* Vishwanath & Tombi

1986. *Puntius jayarami* Vishwanath Singh & Tombi Singh, *Rec. zool. Surv. India*, **83** (1&2) : 129, fig. 1 (type-locality : Chakpi stream, Chakpi karong, South Imphal).

1991. *Puntius jayarami* : Jayaram, Revision of the Genus *Puntius* Hamilton from the Indian Region. *Rec. zool. Surv. India, Occ. Paper No. 135* : 124-126, fig. 1.

Material examined : (i) 2 exs., 95-145 mm, Chakpi river at Sherow, Coll. W. Viswanath & Tombi Singh, 18.iii.92.

Geographical Distribution : Chakpi river, Imphal, Manipur.

Fishery Information : Not known.

+53. *Puntius gelius* (Hamilton)

1822. *Cyprinus gelius* Hamilton-Buchanan, *Fishes of Ganges*, : 320, 390, pl. 145, fig. 3 (type-locality : ponds and ditches of north east Bengal).

1991. *Puntius gelius* : Jayaram, Revision of the Genus *Puntius* Hamilton from the Indian Region. *Rec. zool. Surv. India, Occ. Paper No. 135* : 168-170.

Material examined : (i) 7 exs., 47-87 mm, Nightingam, 35 kms from Imphal, Coll. P.K. & party, 26.xi.91.

Geographical Distribution : India : Bihar, West Bengal, Assam and Orissa (new record from Manipur); Pakistan and Bangla Desh.

Fishery Information : It attains a length of about 90 mm and is an ideal aquarium fish.

55. *Puntius sarana sarana* (Hamilton)

1822. *Cyprinus sarana* Hamilton-Buchanan, *Fishes of Ganges* : 307, 388 (type-locality : ponds and rivers of Bengal).

1991. *Puntius sarana sarana* : Jayaram, Revision of the Genus *Puntius* Hamilton from the Indian Region. *Rec. zool. Surv. India, Occ. Paper No. 135* : 113-118.

Material examined : (i) 3 exs., 60-83 mm, Chakpi river at Chakpikarong, 13 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93.

Geographical Distribution : India : throughout except peninsular India south of Krishna river.

Elsewhere : Pakistan; Nepal; Bangla Desh and Bhutan.

Fishery Information : It attains a length of about 300 mm and is widely distributed all over India in rivers and tanks. A barb of significant fisheries importance.

+57. *Puntius shalynius* Yazdani & Talukdar

1975. *Puntius shalynius* Yazdani and Talukdar, *J. Bombay nat. Hist. Soc.*, **72** (1) : 218, fig. (type-locality : Barapani Lake, near Shillong, Meghalaya).

1991. *Puntius shalynius* : Jayaram, Revision of the genus *Puntius* Hamilton from the Indian Region. *Rec. zool. Surv. India, Occ. Paper No. 135* : 30-32.

Material examined : (i) 7 exs., 56-64 mm, Chakpi River at Nungpan, 9 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93.

Geographical Distribution : India : Meghalaya, Assam (new record from Manipur).

Fishery Information : It attains a length of about 70 mm; is one of the common species in the Khasi hill-stream and is of minor fishery value.

++58. *Puntius shanensis* (Hora & Mukherjee)

1936. *Barbus shanensis* Hora and Mukherjee, *Rec. Indian Mus.*, **36** (3) : 362, fig. 3 (type-locality : Lawksawk, South Shan States, Myanmar).

1991. *Puntius shanensis* : Talwar and Jhingran, *Inland Fishes of India and adjacent Countries*, 287, fig. 98.

Material examined : (i) 1 ex., 60 mm, Chakpi river at Nungpan, 9 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93.

Geographical Distribution : Myanmar : South Shan States (new record from India).

Fishery Information : Not known.

59. *Puntius sophore* (Hamilton)

1822. *Cyprinus sophore* Hamilton-Buchanan, *Fishes of Ganges* : 310, 389 pl. 19, fig. 86 (type-locality : ponds and rivers in Gangetic provinces).

1991. *Puntius sophore* : Jayaram, Revision of the Genus *Puntius* Hamilton from the Indian Region. *Rec. zool. Surv. India, Occ. Paper No. 135* : 15-20.

Material examined : (i) 1 ex., 63 mm, Thangal market, Imphal, Coll. P.K. & party, 22.xi.91 (ii) 1 ex., 50 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xi.91 (iii) 1 ex., 77 mm, Nightingam, 35 kms from Imphal, Coll. P.K. & party, 26.xi.91 (iv) 2 exs., 82-101 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (v) 1 ex., 60 mm, Pachau Fish Breeding Farm, 3 kms south of P.W.D.I.B., Jiribam, Coll. A.K.K. & party, 18.iii.93 (vi) 2 exs., 68-73 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Nepal; Bangla Desh; Myanmar and China.

Fishery Information : It attains a length of about 130 mm and is of minor fishery value. This barb is considered of medical value in Tamil Nadu.

60. *Puntius ticto* (Hamilton)

1822. *Cyprinus ticto* Hamilton-Buchanan, *Fishes of Ganges* : 314, 398, pl. 8, fig. 87 (type-locality : south-eastern parts of Bengal).

1991. *Puntius ticto* : Jayaram, Revision of the Genus *Puntius* Hamilton from the Indian Region. *Rec. zool. Surv. India, Occ. Paper No. 135* : 22-26.

Material examined : (i) 9 exs., 47-85 mm, Moirang Market, Coll. P.K. & party, 24.xi.91 (ii) 11 exs., 67-90 mm, without village, 15 kms from

Imphal, Coll. P.K. & party, 23.xi.91 (iii) 11 exs., 72-90 mm, Imphal Fish Market, Coll. P.K. & party, 25.ii.91 (iv) 8 exs., 53-65 mm, Thangal Market, Imphal, Coll. P.K. & party, 22.xi.91 (v) 1 ex., 55 mm, Pond at Lzeikrei, Coll. T.R. & party, 25.ii.92 (vi) 1 ex., 36 mm, Khordak river, west of Keibul Lamjao Sanctuary, Coll. T.R. & party, 2.iii.92 (vii) 12 exs., 67-84 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xii.91 (viii) 3 exs., 40-51 mm, Moirang Market, Coll. P.K. & party, 1.xii.91 (ix) 2 exs., 75-80 mm, Takmu Fish Farm, Coll. T.R. & party, 27.ii.92 (x) 15 exs., 41-75 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (xi) 2 exs., 40-41 mm, Fish Farm at Tuibuang, 2 kms west of Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93 (xii) 1 ex., 30 mm, Rangazak stream 15 kms north of Ukhrul, Coll. A.K.K. & party, 9.iii.93 (xiii) 3 exs., 40-62 mm, Khuga river, 2 kms away from Circuit House, Churachandpur, Coll. A.K.K. & party, 10.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Nepal; Sri Lanka; Bangla Desh; Myanmar and Thailand.

Fishery Information : It attains a length of about 100 mm, a popular barb in the aquaria.

Genus *Tor* Gray, 1834

1834. *Tor* Gray *Illustrations of Indian Zoology*, 2 : 196 (type-species : *Cyprinus tor* Hamilton-Buchanan).

Body elongate; deep anteriorly, the trunk and peduncle smoothly tapered. Head small, with a prominent snout. Mouth varying from inferior to sub-inferior, upper jaw often protractile. Lips thick and well developed, lower lip with a distinctive median fleshy lobe below the mandibular symphysis. Barbels 2 pairs and well developed. Dorsal fin inserted opposite to pelvic fins, with 12 to 13 rays and a strong and smooth spine. Anal fin with 7 to 8 rays. Lateral line complete, with 22 to 37 scales.

Key to the species of Genus *Tor*

1. Length of head considerably greater than body depth; lower fins yellowish..... *T. putitora*
- Length of head equal to or shorter than body depth; lower fins usually red or orange 2

2. Length of head almost equal to body depth; eyes not visible from underside of head
 *T. progeneius*
 Length of head shorter than body depth; eyes visible from underside of head *T. tor*

Subfamily GARRINAE

Genus *Crossocheilus* Kuhl et van Hasselt, 1823

1823. *Crossocheilus* Kuhl et van Hasselt, *Algemeine Konst. en Letter Bode*, 2(35) : 132 (type-species : *Crossocheilus oblongus* Kuhl et van Hasselt).

Body moderately elongate with a rounded abdomen. Head rather small; snout obtusely rounded. Mouth inferior; upper lip well developed, lower lip fleshy. Usually 1 pair of rostral barbel. Dorsal fin inserted in advance of pelvic fins, with 10 to 11 soft rays and without a spine. Anal fin with 7 rays. Lateral line complete, with 33 to 46 scales.

Key to the species of Genus *Crossocheilus*

- Head length less than 5 times (4.3 to 5.0) in standard length. Lateral line scales 35
 *C. burmanicus*
- Head length more than 5 times (5.1 to 5.2) in standard length. Lateral line scales 37 to 42
 *C. latius*

65. *Crossocheilus burmanicus* Hora

1936. *Crossocheilus latius burmanicus* Hora, *Rec. Indian Mus.*, 38(3) : 324 (type-locality : Myanmar).
 1991. *Crossocheilus burmanicus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 414-415.

Material examined : (i) 3 exs., 72-74 mm, Iril river, a tributary of Imphal river, Coll. Shyam Kishore Singh, 4.x.92.

Geographical Distribution : India : Manipur.

Elsewhere : Myanmar.

Fishery Information : It attains a length of about 130 mm and of no interest to fisheries.

Genus *Garra* Hamilton-Buchanan, 1822

1822. *Garra* Hamilton-Buchanan, *Fishes of Ganges* : 343, 393 (type-species : *Cyprinus lamta* Hamilton-Buchanan).

Body elongate and subcylindrical. Under surface of the head and body flattened. Mouth inferior, transverse and semicircular; a suctorial disc present on chin. A proboscis may be present. Barbels 1 or 2 pairs or entirely absent. Dorsal fin inserted in advance of pelvic fins, with 9 to 12 rays and no spine. Paired fins horizontally placed. Anal fin with 6 to 8 rays. Lateral line complete, with 32 to 40 scales.

Key to the species of Genus *Garra*

1. Proboscis present 2
 Proboscis absent 4
2. Proboscis trilobed, 2 pairs of barbels present *G. nasuta*
 Proboscis a single projection without lateral lobes 3
3. Proboscis weakly developed without lateral tubercular area *G. graveli*
 Proboscis well developed with well defined lateral tubercular area *G. gotyla*
4. Lateral line scales 34 or fewer 5
 Lateral line scales 35-40 6
5. Dorsal fin with a light black bar across and caudal fin with broad W-shaped bands
 (a) Back and post-pelvic region scaled
 *G. lissorhynchus*
 (b) Back and post-pelvic region naked
 *G. rupecula*
 Dorsal and caudal fins without such markings *G. manipurensis*
6. Vent situated almost midway between anterior origin of anal and pelvic fins *G. kempi*
 Vent not situated midway between anterior origin of anal and pelvic fins *G. naganensis*

72. *Garra naganensis* Hora

1921. *Garra naganensis* Hora, *Rec. Indian Mus.*, 22 (5) : 667, pl. 25, figs. 2, 2a (type-locality : Near Kairong, Naga Hills, Nagaland).
 1991. *Garra naganensis* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* 430.

Material examined : (i) 1 ex., 58 mm, Moirang Market, Coll. P.K. & party, 1.xii.91 (ii) 1 ex., 57 mm, Nong Sung Kong (stream), 20 kms south of Ukhrul, Coll. A.K.K. & party, 8.iii.93 (iii) 1 ex., 52 mm, Rangazak stream, 15 kms north of Ukhrul, Coll. A.K.K. & party, i.iii.93 (iv) 7 exs., 32-38 mm, Chakpi river at Chakpi Karang, 13 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93 (v) 3 exs., 82-90 mm, Chakpi river at Chakpi Karang, Dist. Chandel, Coll. W. Vishwanath and Manoj Kumar, 12.xi.92.

Geographical Distribution : India : Naga Hills, Nagaland, Manipur.

Fishery Information : This species attains a length of about 100 mm and is of no interest to fisheries.

Family HOMALOPTERIDAE

Subfamily NOEMACHEILINAE

Genus *Noemacheilus* Bleeker, 1823

1823. *Noemacheilus* Kuhl et van Hasselt, *Algemeine Konst en Letter Bode*, 2 (35) : 133 (type-species : *Noemacheilus fasciatus* Kuhl et van Hasselt).

Body elongate, almost cylindrical and somewhat depressed. Mouth small and inferior. Eyes minute to small. Preorbital spine on head absent. Barbels 2 to 4 pairs. Dorsal fin inserted opposite to pelvic fins, with 8 to 20 soft rays and devoid of any spine. Anal fin with 6 to 8 soft rays. Caudal fin emarginate, truncate, or lunate. Scales minute. Lateral line complete or incomplete.

Key to the species of Genus *Noemacheilus*

1. Dorsal fin with 9 to 11 branched rays 2
- Dorsal fin with 6 to 8 branched rays 3
2. Lateral line usually complete often ending only beyond base of anal fin. Caudal fin slightly emarginate *N. botia*
- Lateral line incomplete, ending below dorsal fin base. Caudal fin emarginate *N. zonalternans*
3. Caudal fin truncate. Lateral line incomplete. Body with many narrow bands, narrower than

interspace between them and descending upto ventral surface *N. manipurensis*

- Caudal fin deeply forked 4
- 4. Lateral line incomplete 5
- Lateral line complete 6
- 5. Dorsal fin with 6 to 7 branched rays. Body with 7 to 11 broad black complete bands *N. kangjupkhulensis*
- Dorsal fin with 8 branched rays. Body above lateral line marked by characteristic reticulations *N. prashadi*
- 6. Bands on body not continuous from back but disjoined and not descending to ventral surface. Caudal fin with V-shaped band *N. scaturigina*
- Body with 12 to 13 black bands encircling the body, nearly upto base of pectoral fin. A black bar at the base of caudal fin .. *N. sikmaiensis*

76. *Noemacheilus botia* (Hamilton)

1822. *Cobitis botia* Hamilton-Buchanan, *Fishes of Ganges* : 350, 394 (type-locality : rivers of north-eastern Bengal).

1987. *Noemacheilus botia* : Menon, *Fauna of India*, Pisces (Teleostei : Cobitoidea : Homalopteridae) 4 (Part 1) : 141, pl. 5, fig. 5.

Material examined : (i) 9 exs., 50-80 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93 (ii) 1 ex., 65 mm, Khuga river, 2 kms away from Circuit House, Churachandpur, Coll. A.K.K. & party, 10.iii.93.

Geographical Distribution : India : Northern India, Brahmaputra and Ganga basins.

Elsewhere : Pakistan; Nepal; Myanmar; Bangla Desh and Sri Lanka.

Fishery Information : This species attains a length of 90 mm and is of no interest of fisheries.

78. *Noemacheilus kangjupkhulensis* Hora

1921. *Noemacheilus kangjupkhulensis* Hora, *Rec. Indian Mus.*, 22 : 202, pl. 10, figs. 4, 4a (type-locality : Manipur valley).

1987. *Noemacheilus kangjupkhulensis* : Menon. *The Fauna of India*; Pisces (Teleostei : Cobitoidea : Homalopteridae) 4 (Part 1) : 115-117, figs. 2 & 3, pl. 5.

Material examined : 2 exs., 40-52 mm, Sekmai river at Sekmai, dist. Imphal, Coll. W. Viswanath and Manoj Kumar, 11.xii.92.

Geographical Distribution : Manipur.

Elsewhere : Myanmar.

Fishery Information : It attains a length of about 52 mm and is of no interest to fisheries.

79. *Noemacheilus manipurensis* Chaudhuri

1912. *Nemacheilus manipurensis* Chaudhuri, *Rec. Indian Mus.*, 7 : 443, pl. 40, figs. 4, 4a, 4b and pl. 41, figs. 1, 1a, 1b (type-locality : Manipur).

1987. *Noemacheilus manipurensis* Menon : *Fauna of India*, Pisces (Teleostei : Cobitoidea : Homalopteridae), 4(1) : 121, pl. 12, fig. 4.

Material examined : 1 ex., 50 mm, Nung Sung Kong (stream), 20 kms south of Ukhrul, Coll. A.K.K. & party, 8.iii.93 (ii) 9 exs., 45-48 exs., Chakpi river at Nungpan, 9 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93 (iii) 1 ex., 75 mm, Rangazak stream, 15 kms north of Ukhrul, Coll. A.K.K. & party, 9.iii.93 (iv) 3 exs., 52-65 mm, Sekmai river at Sekmai, Coll. W. Viswanath & Manoj Kumar, 11.xii.92.

Geographical Distribution : India : Manipur valley and Nagaland.

Fishery Information : It attains a length of 80 mm and is of no interest to fisheries.

80. *Noemacheilus prashadi* Hora

1921. *Nemacheilus prashadi* Hora, *Rec. Indian Mus.*, 22(3) : 203, pl. 10, figs. 2, 2a (type-locality : nr Yaribuk, Manipur).

1987. *Noemacheilus prashadi* Menon : *Fauna of India*, Pisces (Teleostei : Cobitoidea : Homalopteridae), 4 (Part 1) : 127, pl. 3, figs. 8 & 9.

Material examined : (i) 51 exs., 45-60 mm, Nung Sung Kong (stream), 20 kms south of Ukhrul, Coll. A.K.K. & party, 8.iii.93 (ii) 2 exs., 60-63 mm, Chakpi river at Chakpikarang, Coll. Manoj Kumar, 12.xi.92.

Geographical Distribution : India : Manipur valley.

Fishery Information : It attains a length of 70 mm and is of no interest to fisheries.

81. *Noemacheilus scaturigina* (McClelland)

1839. *Cobitis (Schistura) scaturigina* McClelland, *Asiat. Res.*, 19 : 308, 443, pl. 53, fig. 6 (type-locality : Assam).

1987. *Noemacheilus scaturigina* Menon : *Fauna of India*, Pisces (Teleostei : Cobitoidea : Homalopteridae), 4(1) : 86, pl. 3, fig. 2 & 3 and pl. 13, figs. 8 & 9.

Material examined : (i) 3 exs., 50-53 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93 (ii) 2 exs., 48-55 mm, Hill stream of Ukhrul, Coll. A. Renubala Devi, 12.xii.92.

Geographical Distribution : India : North Bengal, Assam, Arunachal Pradesh, Manipur.

Elsewhere : Nepal.

Fishery Information : It attains a length of about 70 mm and is of no interest to fisheries.

Family COBITIDAE

Subfamily BOTIINAE

Genus *Botia* Gray, 1831

1831. *Botia* Gray, *Zool. Misc.*, : 8 (type-species : *Botia almorhae* Gray).

Body robust, moderately elongate and laterally compressed. Head long and pointed downwards. A bifid spine present in the antero-ventral direction of the eye. Mouth small and ventral; lips thick. Barbels 3 to 4 pairs. Dorsal fin inserted above or anterior to origin of pelvic fins, with 10-16 rays. Anal fin with 7 to 9 rays. No scales on head. Lateral line present.

Key to the species of the Genus *Botia*

1. Three pairs of barbels present *B. berdmorei*
Four pairs of barbels present 2
2. Dorsal fin inserted slightly behind insertion of pelvic fin and originates nearer base of caudal fin than to snout tip. Eye diameter 2.5 in snout length *B. histrionica*
Dorsal fin inserted opposite pelvic fin and originates almost equidistant from snout tip and caudal fin base. Eye diameter 3.0 in snout length *B. dario*

84. *Botia berdmorei* (Blyth)

1861. *Syncrossus berdmorei* Blyth, *J. Asiat. Soc. Beng.*, **29** : 166 (type-locality : Tenasserian Provinces, Myanmar).
1922. *Botia hymenophysa* (nec Bleeker) Hora, *Rec. Indian Mus.*, **24**(3) : 317.
1992. *Botia berdmorei* : Menon, 1992. *The Fauna of India* (Pisces : Cobitoidea : Cobitidae) **4** (Part 2) : 46-48.

Material examined : (i) 2 exs., 108-128 mm, Ithai barage (on Imphal river), Bishenpur district, Coll. W. Vishwanath, July 1991 (ii) 1 ex., 82 mm, Imphal river, Coll. Shyam Kishore Singh, 12.xii.92.

Geographical Distribution : India : Manipur.

Elsewhere : Myanmar and Central Thailand.

Fishery Information : It attains a length of about 140 mm, a rare loach in India and of no interest to fisheries.

85. *Botia dario* (Hamilton)

1822. *Cobitis dario* Hamilton-Buchanan, *Fishes of Ganges* : 354, 394, pl. 29, fig. 95 (type-locality : northern rivers of Bengal).
1992. *Botia dario* : Menon, *The Fauna of India* (Pisces : Cobitoidea : Cobitidae), **2** (Part 2) : 39-41.

Material examined : (i) 1 ex., 103 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93 (ii) 2 exs., 65-90 mm, Jiri river at Jiribam, Coll. W. Vishwanath, 1989.

Geographical Distribution : India : Ganga and Brahmaputra drainages.

Elsewhere : Bangla Desh.

Fishery Information : It attains a length of about 110 mm and is of no interest to fisheries.

Subfamily COBITINAE**Genus *Acanthophthalmus* Van Hasselt, 1824**

1823. *Acanthophthalmus* van Hasselt, *Alg. Konst. Letterbode*, **2** : 132 (Type-species : *Acanthophthalmus fasciatus* van Hasselt).

Body very elongate or anguilliform, laterally compressed. Head small, with inferior mouth. 6 barbels. Mental lobes well developed. Dorsal fin inserted above the interspace between ventral and

anal. Ventral fin on the second half of the body. Caudal truncated. Scales minute, slightly imbricated. Head naked. Lateral line absent or very short.

87. *Acanthophthalmus pangia* (Hamilton)

1822. *Cobitis pangia* Hamilton-Buchanan, *Fishes of Ganges* : 355, 394 (type-locality : North eastern parts of Bengal).
1992. *Acanthophthalmus pangia* : Menon, *The Fauna of India* (Pisces : Cobitoidea : Cobitidae), **4** (Part 2) : 87-91, Text-fig. 8A.

Material examined : (i) 6 exs., 58-83 mm, Imphal river at Imphal, Coll. W. Vishwanath, 1989.

Geographical Distribution : India : North-eastern Bengal, Assam and Manipur.

Elsewhere : Bangla Desh and Myanmar.

Fishery Information : This loach attains a length of about 85 mm and is of no interest to fisheries. But consumed by local people at Manipur and sold in the fish market there.

Genus *Lepidocephalus* Bleeker, 1858

1858. *Lepidocephalus* Bleeker, *Natuurk. tijdschr. Nederl. Ind.*, **16** : 303 (Type-species : *Cobitis macrochir* Bleeker).

Body elongate, slightly compressed. Back not arched. Mouth inferior with 6 barbels. A small erectile, bifid suborbital spine. Dorsal fin inserted opposite to ventrals and placed almost on middle of body. Caudal fin rounded truncate or emarginate. Scales small, but visible. Sides of head covered with smaller scales in patches. Lateral line absent.

Key to the species of Genus *Lepidocephalus*

1. Dorsal side of head scaled. Dorsal and pelvic fins inserted in second half of body *L. irrorata*
- Dorsal side of head naked. Dorsal and pelvic fins inserted in first half of body 2
2. Caudal fin deeply emarginate *L. caudafurcatus*
- Caudal fin truncate, rounded, slightly emarginate 3

3. Pectoral fin with 9 to 10 rays. Body depth 7.0 to 7.7 times in total length. Caudal fin slightly emerginate *L. berdmorei*

Pectoral fin with 7 to 8 rays. Body depth 5.8 to 6.8 times in total length. Caudal fin rounded or cut square *L. guntea*

88. *Lepidocephalus berdmorei* (Blyth)

1861. *Acanthopsis berdmorei* Blyth, *J. Asiat Soc. Beng.*, 29 : 168 (type-locality : Tenasserim province, Myanmar).
1981. *Lepidocephalus (Lepidocephalichthys) berdmorei* : Tilak and Hussain, *Rec. zool. Surv. India, Occ. Paper No. 32* : 14, figs. 7 & 8 (Redescription).

Material examined : (i) 6 exs., 65-70 mm, Serou village, 12 kms away from Sugnu, Coll. A.K.K. & party, 16.iii.93 (ii) 2 exs., 72-75 mm, Khuga river near Churachandpur (Market coll.), Coll. A.K.K. & party, 10.iii.93 (iii) 1 ex., 75 mm, Fish Farm, 1 km away from Circuit House, Churachandpur, 11.iii.93.

Geographical Distribution : India : Manipur; and Myanmar.

Fishery Information : It attains a size of about 80 mm and is of no interest to fisheries.

+89. *Lepidocephalus caudofurcatus* Tilak & Hussain

1978. *Lepidocephalus caudofurcatus* Tilak and Hussain, *Matsya*, (3) : 60, figs. 1-3 (type-locality : Rishikesh, Uttar Pradesh).
1981. *Lepidocephalus (Lepidocephalichthys) caudofurcatus* : Tilak and Hussain, 1981, *Occ. Paper Rec. zool. Surv. India*, (32) : 24, figs. 16, 17 (Redescription).

Material examined : (i) 1 ex., 63 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : Doon Valley, Uttar Pradesh and Assam (new record from Manipur).

Fishery Information : It attains a length of about 75 mm and is of no interest to fisheries.

90. *Lepidocephalus guntea* (Hamilton)

1822. *Cobitis guntea* Hamilton-Buchanan, *Fishes of Ganges* : 353, 394 (type-locality : Bengal).

1981. *Lepidocephalus (Lepidocephalichthys) guntea* : Tilak and Hussain, *Rec. zool. Surv. India, Occ. Paper No. 32* : 7, figs. 1-4.

Material examined : 1 ex., 35 mm, Bishenpur, Coll. P.K. & party, 27.xi.91 (ii) 1 ex., 65 mm, Thoubal Fishing Centre, Coll. P.M. & party, 29.xi.91 (iii) 1 ex., 70 mm, Khuga River, 5 kms east of I.B., Churachandpur, Coll. T.R. & party, 9.iii.92 (iv) 1 ex., 80 mm, Keibul Lamjao, Coll. T.R. & party, 1.iii.92 (v) 3 exs., 42-82 mm, Nightingam, 35 kms from Imphal, Coll. P.K. & party, 26.xi.91 (vi) 1 ex., 51 mm, Nung Sung Kong (stream), 20 kms from Ukhrul, Coll. A.K.K. & party, 8.iii.93.

Geographical Distribution : India : throughout except Karnataka, Kerala and south of Krishna.

Elsewhere : Pakistan; Bangla Desh; Nepal; Myanmar; and Thailand.

Fishery Information : It attains a length of about 150 mm and of no interest to fisheries. But it is widely used as an aquarium fish.

Order SILURIFORMES

Family BAGRIDAE

Genus *Mystus* Scopoli, 1777

1777. *Mystus* Scopoli, *Introductio ad historiam naturalem* : 451 (type-specimen : *Bagrus haplepenis* Valenciennes = *Silurus pelusius* Solander).

Body moderately elongate, posteriorly compressed. Head rather depressed and smooth. Eyes moderately large, not visible from underside of head. Mouth terminal and moderately wide. 4 pairs of barbels, maxillary barbels extend beyond dorsal fin. Rayed dorsal fin with one serrated spine and 7 soft rays; adipose dorsal low. Anal fin short, with 9 to 16 soft rays. Lateral line complete.

Key to the species of Genus *Mystus*

1. Occipital process not reaching basal bone of dorsal fin. Eye diameter 6.0 to 8.0 in head length. No spot at the base of caudal fin
..... *M. microphthalmus*
- Occipital process reaching basal bone of dorsal fin 2

2. Adipose dorsal fin commencing immediately after rayed dorsal fin 3
- Adipose dorsal fin commencing after an interspace from rayed dorsal fin; longer than anal fin base. A dark blotch at the base of caudal fin *M. armatus*
3. Maxillary barbels reach base of pelvic fins. Head length not more than 4 times in total length *M. tengara*
- Maxillary barbels reach base of anal fin. Head length more than 5 times in total length *M. bleekeri*

95. *Mystus bleekeri* (Day)

1846. *Bagrus keletius* (nec Valenciennes) Bleeker, *Nat. Geneesk. Arch. Ned. Indie*, (2) 3 : 135 (type-locality : Bengal).
1877. *Macrones bleekeri* Day, *Fishes of India* : 451, pl. 101, fig. 1 (Replacement name for *Bagrus keletius* Bleeker, 1846).
1991. *Mystus bleekeri* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 558-559.

Material examined : (i) 2 exs., 148-155 mm, Moirang Market, Coll. P.K. & party, 24.xi.91 (ii) 1 ex., 115 mm, Bishenpur, Coll. P.K. & party, 27.xi.91 (iii) 1 ex., 135 mm, Nightingam, 35 kms from Imphal, Coll. P.K. & party, 26.xi.91 (iv) 3 exs., 100-108 mm, Keibul Lamjao Sanctuary, Coll. T.R. & party, 1.iii.92 (v) 2 exs., 130-135 mm, Moirang Market, Coll. P.K. & party, 1.xii.91 (v) 1 ex., 130 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (vii) 1 ex., 80 mm, Chakpi River at Nungpan, 9 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93 (viii) 1 ex., 115 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : generally confined to northern India, the southern most limit being the Mahanadi head-waters.

Elsewhere : Pakistan; Bangla Desh; Nepal; Myanmar and Sumatra.

Fishery Information : It attains a length of about 160 mm and obtained in the fishing operations along with other fishes. No major fishery exists for this catfish.

Family SCHILBEIDAE

Genus *Ailia* Gray, 1831

1831. *Ailia* Gray, *Zool. Miscellany* : 8 (type-species : *Malapterus* (sic) (*Ailia*) *bengalensis* Gray = *Malapterurus coila* Hamilton-Buchanan).

Body elongate, strongly compressed. Mouth subterminal and fairly wide. Barbel 4 pairs, well developed. Eyes small, visible from underside of the head. Rayed dorsal fin absent, adipose dorsal fin small. Anal fin very long, with 58 to 90 rays. Pectoral fin with 1 spine and 13 to 16 rays. Lateral line complete.

+101. *Ailia punctata* (Day)

1871. *Ailiichthys punctata* Day, *Proc. Zool. Soc. Lond.*, : 713 (type-locality : Jamuna river below Delhi).
1991. *Ailia punctata* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 594.

Material examined : 1 ex., 95 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : Ganga, Jamuna and Indus River Systems (First record from Manipur).

Elsewhere : Bangla Desh; and Pakistan.

Fishery Information : It attains a length of 100 mm and is of no interest to fisheries.

Genus *Clupisoma* Swainson, 1839

1839. *Clupisoma* Swainson, *Natural History Animals, Fishes*, 2 : 306 (type-species : *Pinelodus argentata* Swainson = *Silurus garua* Hamilton-Buchanan).

Body elongate and compressed. Abdominal edge either rounded or keeled (entirely or partly). Eyes moderate, visible from under-side of head. Nostrils prominent and closely placed. Mouth moderate, subterminal; its gape not extending to eye. Barbels 4 pairs, all placed at same level. Gill membranes free from isthmus. Dorsal fin inserted considerably in advance of pelvic fins, with 1 spine and 6 to 9 soft rays. A small adipose dorsal usually present. Anal fin long, with 29 to 54 soft rays.

+102. *Clupisoma prateri* Hora

1877. *Pseudeutropius garua* (nec. Hamilton-Buchanan) Day (Partim), *Fishes of India* : 474.

1937. *Clupisoma prateri* Hora, *J. Bombay nat. Hist. Soc.*, **39** (4) : 671, figs. 2b, 3b (type-locality : Mandalay and Bassein, Myanmar).

1991. *Clupisoma prateri* : Talwar and Jhingran, *Inland fishes of India and Adjacent Countries*, : 599-600.

Material examined : (i) 3 exs., 95-100 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India : North Bengal, Bihar, U.P., Madhya Pradesh (new record from Manipur).

Elsewhere : Bangla Desh; and Myanmar.

Fishery Information : It attains a length of 270 mm and is of no interest to fisheries.

Family SISORIDAE

Genus *Gagata* Bleeker, 1858

1858. *Gagata* Bleeker, *Ichthyol. Archipel. Ind. Prodromus*, **1** : 204 (type-species : *Gagata typus* Bleeker = *Pimelodus gagata* Hamilton-Buchanan).

Body and head compressed. A distinct median groove on head present. Occipital process not reaching basal bone of dorsal fin. Eyes large, dorsolateral in position. Mouth small and ventral, no teeth on palate. Barbels 4 pairs, maxillary barbels with osseous bases and lying in a groove. Gill membranes confluent with isthmus. Dorsal fin with 1 strong spine and 6 rays, anal fin short with 11 to 16 rays.

Key to the species of Genus *Gagata*

- Median longitudinal groove on head extends to end of supraoccipital process. Distal portion of all fins except caudal coloured dusky *G. gagata*
- Median longitudinal groove on head does not extend to full length of supra-occipital process. Distal portion of all fins except caudal are not dusky *G. cenia*

109. *Gagata cenia* (Hamilton)

1822. *Pimelodus cenia* Hamilton-Buchanan, *Fishes of Ganges* : 174, 376, pl. 31, fig. 57 (type-locality : rivers of North Bengal).

1991. *Gagata cenia* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 637-638.

Material examined : (i) 3 exs., 60-75 mm, Jiri river at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93 (ii) 1 ex., 65 mm, Jiri river at Jiribam, W. Viswanath, 1989.

Geographical Distribution : India : Punjab, Delhi, Uttar Pradesh, Bihar, West Bengal, Assam and Orissa, Manipur.

Elsewhere : Pakistan; Bangla Desh; Nepal; and Myanmar.

Fishery Information : It attains a length of about 170 mm, fairly common in the rivers of northern India and also in Assam. This fish is considered a wholesome food.

110. *Gagata gagata* (Hamilton)

1822. *Pimelodus gagata* Hamilton-Buchanan, *Fishes of Ganges* : 197, 379, pl. 39, fig. 65 (type-locality : rivers and estuaries of Bengal).

1991. *Gagata gagata* : Talwar and Jhingran, *Inland Fishes of India and its Adjacent Countries*, : 638-639.

Material examined : 1 ex., 120 mm, Jiri river at Jiribam, Coll. W. Vishwanath, 1989.

Geographical Distribution : India : Ganga and Brahmaputra river systems.

Elsewhere : Bangla Desh and Myanmar.

Fishery Information : It attains a length of about 300 mm and is of no interest to fisheries.

Genus *Glyptothorax* Blyth, 1861

1861. *Glyptothorax* Blyth, *J. Asiat. Soc. Beng.*, **29** : 154 (type-species : *Glyptothorax trilineatus* Blyth).

Body laterally depressed or cylindrical. Head depressed; eyes small, dorsal in position. A prominent thoracic sucking disc present often with a central pit. Mouth inferior, transverse and narrow, lips thick and fleshy. Barbels 4 pairs, maxillary barbels with broad bases. Gill membranes confluent with skin of isthmus. Rayed dorsal fin with 1 spine and 5 to 7 soft rays. A short adipose dorsal present. Pectoral fin with a strong spine denticulated internally. Anal fin with 7 to 14 soft rays. Lateral line complete.

Key to the species of Genus *Glyptothorax*

1. Occipital process not reaching basal bone of dorsal fin. Dorsal spine strong. Dark patches

at the base of dorsal and caudal fins conspicuous *G. sinense manipurensis*

- Occipital process reaching basal bone of dorsal fin 2
- 2. Body depth 4.5 in standard length. Body with three longitudinal stripes *G. trilineatus*
- Body depth 5.0 to 5.5 in standard length. Skin with prominent tubercles arranged in regular longitudinal lines *G. platypogonoides*

115. *Glyptothorax trilineatus* Blyth

1861. *Glyptothorax trilineatus* Blyth, *J. Asiat. Soc. Beng.*, **29** : 154 (type-locality : Tenasserim, Myanmar).
 1991. *Glyptothorax trilineatus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 665, fig. 221.

Material examined : (i) 2 exs., 80-88 mm., Serou village, 12 kms away from Sugnu, Coll. A.K.K. & party, 16.iii.93 (ii) 1 ex., 80 mm, Chakpi river at Nungpan, 9 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93.

Geographical Distribution : India : Manipur.

Elsewhere : Myanmar and Thailand.

Fishery Information : It is reported to attain a length of 300 mm and is of minor interest to fisheries in Manipur.

Genus *Nangra* Day, 1877

1877. *Nangra* Day, *Fishes of India* : 493 (type-species : *Pimelodus nangra* Hamilton-Buchanan).

Body short and compressed; with rounded abdomen. Head short and snobnosed. Eyes large, not visible from ventral side of head. Mouth narrow, ventral and transverse. Barbels 4 pairs; maxillary barbels with stiff bases; mendibular barbels are placed on a transverse row at different levels. Dorsal fin inserted above postero-quarter of pectoral fin, with 1 strong spine and 6 to 10 soft rays. Anal fin with 11 to 13 rays. Gill membranes confluent with each other, also with isthmus.

+116. *Nangra viridescens* (Hamilton)

1822. *Pimelodus viridescens* Hamilton-Buchanan, *Fishes of Ganges* : 173, 376, pl. 10, fig. 56 (type-locality : rivers of northern Bengal).

1991. *Nangra viridescens* Talwar and Jhingran : *Inland Fishes of India and Adjacent Countries* : 677-678, fig. 216.

Material examined : (i) 3 exs., 74-77 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93 (ii) 1 ex., 75 mm, Jiri river at Jiribam, Coll. W. Viswanath, 1989.

Geographical Distribution : India : Yamuna river at Delhi, rivers of North Bengal, Punjab, Uttar Pradesh, Bihar and Assam (new record from Manipur).

Elsewhere : Bangla Desh and Nepal.

Fishery Information : It attains a length of 85 mm; a good fishery of this species exists in the Some river at Bihar and minor fishery in North Bengal.

Family CLARIIDAE

Genus *Clarias* Scopoli, 1777

1777. *Clarias* Scopoli, *Introductio ad Historiam Naturalem* : 455 (type-species : *Silurus anguillaris* Linnaeus).

Body elongate and compressed. Head depressed, covered with osseous plates dorsally and laterally forming a cask. Eyes small, not visible from underside of head. Gill-membranes free from isthmus. Barbels 4 pairs, well developed. Dorsal fin bases very long with 62 to 77 soft rays and no spine. Pectoral fin with a strong spine and 7 to 11 soft rays. Anal fin base long with 45 to 63 rays. Caudal fin rounded. Lateral line complete.

118. *Clarias batrachus* (Linnaeus)

1758. *Silurus batrachus* Linnaeus. *Systema Naturae*, **1**, ed. 10 : 305 (type-locality : Asia and Africa).
 1991. *Clarias batrachus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 684-685.

Material examined : (i) 1 ex., 101 mm, Withou village, 15 kms from Imphal, Coll. P.K. & party, 23.xi.91 (ii) 1 ex., 118 mm, Imphal Fish Market, Coll. P.K. & party, 25.xi.91 (iii) 2 exs., 90-108 mm, Thangal Market, Imphal, Coll. P.K. & party, 22.xi.91 (iv) 1 ex., 85 mm, Bishenpur, Coll. P.K. & party, 27.xi.91 (v) 1 ex., 120 mm, Pond at Nampal, Coll. T.R. & party, 26.ii.92 (vi) 1 ex., 102 mm, Keibul Lamjao Sanctuary, Coll. T.R. & party, 1.iii.92 (vii) 1 ex., 95 mm, Thanga village, 50 kms from Imphal, Coll. P.K. & party, 28.xi.91.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Nepal; Sri Lanka; Bangla Desh; Myanmar; Indonesia; Singapore; Borneo and Phillipines.

Fishery Information : A fish of high economic importance. It attains a length of about 450 mm and found in all types of water but more so in derelict and swampy waters. This is a hardy fish and can live out of water of quite sometime and move short distance on land and has a accessory respiratory organ.

This catfish is cultured in shallow ponds, cages, cement cisterns, paddy fields and sewage water. It is highly esteemed for its nourishing properties and quick recovery from prolonged illness.

Family HETEROPNEUSTIDAE

Genus *Heteropneustes* Muller, 1840

1840. *Heteropneustes* Muller, *Arch. Anal. Physiol.* : 115 (type-species : *Silurus fossilis* Bloch).

Body elongate, compressed; almost tarpedo-shaped. Head greatly depressed. Mouth small, lips fleshy and papillated. Barbels 4 pairs, well developed. Dorsal fin very short, inserted above tip of pectoral fins and without any spine. Pectoral fin with 1 strong serrated spine and 7 to 8 soft rays. Anal fin base very long with 60 to 79 rays. Caudal fin almost rounded. Lateral line complete.

119. *Heteropneustes fossilis* (Bloch)

1794. *Silurus fossilis* Bloch, *Naturgesch. ausl. Fische*, 8 : 46, pl. 370, fig. 2 (type-locality : Tranquebar, Tamil Nadu).
1991. *Heteropneustes fossilis* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 689-690, fig. 219.

Material examined : (i) 1 ex., 90 mm, Pond at Lzeikrei, Coll. T.R. & party, 25.ii.92 (ii) 1 ex., 175 mm, Khuga river, 5 kms east of I.B., Churachandpur, Coll. T.R. & party, 9.iii.92 (iii) 1 ex., 175 mm, Khutikhong Fish Farm at Jiribam, Coll. A.K.K. & party, 18.iii.93 (iv) 1 ex., 140 mm, Thanga village (Loktak Lake coll.), Coll. A.K.K. & party, 13.iii.93.

Geographical Distribution : India : throughout; Pakistan; Nepal; Bangla Desh; Sri Lanka; Myanmar; Thailand and Laos.

Fishery Information : A fish of high economic importance. It attains a length of about 300 mm and is well known because of its nourishing properties and for quick recovery from illness. It is primarily found in ponds, ditches, bheels, swamps, marshes and sometimes in muddy rivers.

This fish is much dreaded for its aggressive behaviour and causes painful wounds with its potentially dangerous pectoral spines.

Order ATHERINIFORMES

Family CYPRINODONTIDAE

Genus *Aplocheilus* McClelland, 1839

1839. *Aplocheilus* McClelland, *Asiat. Res.*, 19(2) : 301 (type-species : *Esox panchax* Hamilton-Buchanan).

Body moderately elongate, compressed. Head and nape broad and flattened above. Mouth terminal, upper jaw protractile, lower jaw greatly attenuated. Barbels absent. Dorsal fin originates above posterior end of anal fin, with 7 to 9 rays and no spine. Anal fin rather long with 15 to 18 rays. Caudal fin rounded. Lateral line absent. Scales on longitudinal series 25 to 31.

120. *Aplocheilus panchax* (Hamilton)

1822. *Esox panchax* Hamilton-Buchanan, *Fishes of Ganges* : 211, 380, pl. 3, fig. 69 (type-locality : Bengal).
1991. *Aplocheilus panchax* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 752-753.

Material examined : (i) 3 exs., 41-54 mm, Khutikhong Fish Farm at Jiribam, Coll. A.K.K. & party, 18.iii.93 (ii) 18 exs., 27-48 mm, Pachau Fish Breeding Farm, 3 kms. south of P.W.D. I.B., Jiribam, Coll. A.K.K. & party, 18.iii.93.

Geographical Distribution : India : mainly north.

Elsewhere : Pakistan; Bangla Desh; Myanmar; and Indo-Malaysian Archipelago.

Fishery Information : It attains a length of 80 mm, is a larvivorous fish and its utility for mosquito control has been established.

Order CHANNIFORMES

Family CHANNIDAE

Genus *Channa* Scopoli, 1777

1777. *Channa* Scopoli, *Introd. Hist. Nat.*, : 459 (type-species : *Channa orientalis* Bloch & Schneider).

Body elongate, almost cylindrical anteriorly and somewhat compressed posteriorly. Head large, with plate-like scales. Cephalic pits present. Mouth fairly large, lower jaw protruding beyond upper jaw. Dorsal and anal fin long-based, both spineless and free from caudal fin. Dorsal fin inserted almost above pectoral fin, with 29 to 55 rays. Anal fin with 21-36 rays. Caudal fin rounded.

Key to the species of Genus *Channa*

1. 4 to 5 scales between orbit and angle of preopercle. 12 to 13 predorsal scales 2
 - 9 to 10 scales between orbit and angle of preopercle. 15 to 20 predorsal scales 4
2. Pelvic fin less than half length of pectoral fin. Pectoral fin spotted in zones, darker and lighter patches 3
 - Pelvic fin more than half length of pectoral fin. pectoral fin plain *C. punctatus*
3. Anal fin with 26 rays. Dorsal fin with 30 to 40 rays. Circular black spot present in each scale *C. stewartii*
 - Anal fin with 21 to 23 rays. Dorsal fin with 32 to 37 rays. No black spots on scales *C. orientalis*
4. 18 to 20 predorsal scales. Several dark vertical bands below lateral line *C. striatus*
 - 15 to 16 predorsal scales. A large black white edged ocellus on caudal fin base *C. marulius*

122. *Channa orientalis* Bloch & Schneider

1801. *Channa orientalis* Bloch and Schneider, *Syst. Ichth* : 496, pl. 90, fig. 2 (type-locality : India).
1991. *Channa orientalis* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 1019-1020, pl. 289.

Material examined : (i) 1 ex., 135 mm, Moirang Market, Coll. P.K. & party, 24.xi.91 (ii) 2 exs., 70-122 mm, Thangal Market, Imphal, Coll. P.K. & party, 22.xi.91 (iii) 1 ex., 125 mm, Bishenpur, Coll. P.K. & party, 27.xi.91 (iv) 1 ex., 110 mm, Pond at Nampal, Coll. T.R. & party, 26.ii.92 (v) 2 exs., 70-90 mm, Takmu Lake, Coll. T.R. & party, 29.ii.92 (vi) 2 exs., 90-130 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xi.91 (vii) 1 ex., 110 mm, Withou village, 15 kms from Imphal, Coll. P.K. & party, 23.xi.91 (viii) 6 exs., 60-135 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (ix) 1 ex., 116 mm, Chakpi River at Nungpan, 9 kms from I.B., Sugnu, Coll. A.K.K. & party, 16.iii.93 (x) 3 exs., 54-56 mm, Fish Farm, 1 km away from Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93 (xi) 2 exs., 150-190 mm, Hundung village, 6 kms north of Ukhrul, Coll. A.K.K. & party, 8.iii.93 (xii) 1 ex., 74 mm, Rangazak Stream, 15 kms north of Ukhrul, Coll. A.K.K. & party, 09.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Afghanistan; Iran; Pakistan; Nepal; Sri Lanka; Bangla Desh; Myanmar and East Indies.

Fishery Information : It attains a length of about 200 mm and is of minor interest to fisheries in the Indian region.

123. *Channa punctatus* (Bloch)

1793. *Ophiocephalus punctatus* Bloch, *Naturges ausland Fische*, (7) : 139, pl. 358, (type-locality : rivers and lakes of Coromandel coast).
1991. *Channa punctatus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 1020-1021, pl. 290.

Material examined : (i) 4 exs., 95-105 mm, Khutikhang Fish Farm at Jiribam, Coll. A.K.K. & party, 18.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Afghanistan; Pakistan; Sri Lanka; Nepal; Bangla Desh; Myanmar and China.

Fishery Information : It attains a length of about 300 mm; very common throughout the plains of India and is of moderate interest to

fisheries (can be cultured also in derelict water) in Indian region.

+124. *Channa stewartii* (Playfair)

1867. *Ophiocephalus stewartii* Playfair, *Proc. zool. Soc. Lond.*, : 14, pl. 77, fig. 3 (type-locality : Cachar, Assam).
1991. *Channa stewartii* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 1021-1022.

Material examined : (i) 2 exs., 50-55 mm, Fish Farm at Tuibuang, 2 kms from Circuit House, Churachandpur, Coll. A.K.K. & party, 11.iii.93.

Geographical Distribution : India : Assam, Bihar, Meghalaya, Arunachal Pradesh and West Bengal (New record from Manipur).

Fishery Information : It attains a length of about 250 mm and is of minor fishery interest in the Eastern Himalayan Region.

Order PERCIFORMES

Family CHANDIDAE

Genus *Chanda* Hamilton-Buchanan, 1822

1822. *Chanda* Hamilton-Buchanan, *Fishes of Ganges* : 103, 270 (type-species : *Chanda nama* Hamilton-Buchanan).

Body ovate and fairly transparent, with the vertebral column and its adjoining elements visible externally. Lower limit of preopercle provided with double serrated edge; operculum devoid of a prominent spine. Mouth particularly large, with a conspicuous lower jaw. First dorsal fin with 7 spines and second one with 1 spine and 9 to 17 soft-rays. Anal fin with 3 spines and 9 to 17 rays. Lateral line complete, incomplete, interrupted or absent.

Key to the species of Genus *Chanda*

1. Lateral line indistinct, discontinuous or absent. A dark blotch generally present on the upper edge of the dorsal fin *C. nama*
Lateral line distinct. No such colour blotch on dorsal fin 2
2. A dark shoulder spot present *C. ranga*

Shoulder spot absent. A golden spot on occipit
..... *C. baculis*

127. *Chanda baculis* Hamilton

1822. *Chanda baculis* Hamilton-Buchanan, *Fishes of Ganges* : 112, pl. 22, fig. 7 (type-locality : north-eastern parts of Bengal).
1981. *Chanda baculis* : Jayaram, *The Freshwater Fishes of India, Pakistan; Bangla Desh; Myanmar and Sri Lanka* : 318.

Material examined : (i) 3 exs., 47-53 mm, Thanga village, 50 kms from Imphal, Coll. P.K. & party, 28.xi.91.

Geographical Distribution : India : Orissa, West Bengal, U.P., Bihar, upto Punjab.

Elsewhere : Pakistan; Bangla Desh; Myanmar and Thailand.

Fishery Information : It attains a length of about 60 mm, is common in catches in the Indo-Gangetic plains, but is of no interest to fisheries.

128. *Chanda nama* Hamilton

1822. *Chanda nama* Hamilton-Buchanan, *Fishes of Ganges* : 109, 371, pl. 39, fig. 37 (type-locality : Ponds throughout Bengal).
1981. *Chanda nama* : Jayaram, *The Freshwater Fishes of India, Pakistan Bangla Desh, Myanmar and Sri Lanka* : 318.

Material examined : (i) 4 exs., 50-58 mm, Moirang Market, Coll. P.K. & party, 24.xi.91 (ii) 2 exs., 46-52 mm, Imphal Fish Market, Coll. P.K. & party, 25.xi.91 (iii) 2 exs., 53-69 mm, Thangal Market, Imphal, Coll. P.K. & party, 22.xi.91 (iv) 1 ex., 56 mm, Nightingam, 35 kms from Imphal, Coll. P.K. & party, 26.xi.91 (v) 6 exs., 45-50 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xi.91 (vi) 1 ex., 45 mm, Loktak Lake, Coll. T.R. & party, 27.ii.92 (vii) 2 exs., 38-60 mm, Khuga river near Churachandpur (Market coll.), Coll. A.K.K. & party, 10.iii.93 (viii) 1 ex., 45 mm, Jiri River at Gopalthal viillage, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93.

Geographical Distribution : India.

Elsewhere : Pakistan; Nepal; Bangla Desh; and Myanmar.

Fishery Information : It attains a length of about 90 mm and are sold in heaps along with other small fishes as low priced fishes.

129. *Chanda ranga* Hamilton

1822. *Chanda ranga* Hamilton-Buchanan, *Fishes of Ganges* : 113, 371, pl. 16, fig. 38 (type-locality : freshwaters of all parts of Gangetic provinces).
1981. *Chanda ranga* : Jayaram, *The Freshwater fishes of India, Pakistan, Bangla Desh, Myanmar and Sri Lanka* : 318.

Material examined : (i) 1 ex., 37 mm, Takmu Lake, Coll. T.R. & party, 29.ii.92 (ii) 1 ex., 48 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xi.91 (iii) 4 exs., 48-58 mm, Withou village, 15 kms from Imphal, Coll. P.K. & party, 23.xi.91 (iv) 4 exs., 55-72 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Nepal; Bangla Desh; Myanmar; Thailand and Malaysia.

Fishery Information : It attains a length of about 75 mm and are sold in the market alongwith other small fishes. It does fairly well in the aquarium.

Family NANDIDAE

Genus *Badis* Bleeker, 1853

1853. *Badis* Bleeker, *Verh. batav. Genoot. Kunst. Wet.*, 25 : 253 (type-species : *Badis buchani* Bleeker = *Labrus badis* Hamilton-Buchanan).

Body fairly elongate and slightly compressed. Mouth small and slightly protrusible. Operculum triangular, its posterodorsal corner with a prominent spine. Dorsal fin large, with 16 to 18 spines and 7 to 10 soft rays. Anal fin with 3 spines and 6 to 8 soft rays. Caudal fin wedge-shaped. Lateral line interrupted or absent, 26 to 33 scales in longitudinal series.

130. *Badis badis* (Hamilton-Buchanan)

1822. *Labrus badis* Hamilton-Buchanan, *Fishes of Ganges*, : 70, 368, pl. 25, fig. 23 (type-locality : Gangetic provinces).
1991. *Badis badis* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 882-883.

Material examined : (i) 1 ex., 38 mm, Pachau Fish Breeding Farm, 3 kms south of P.W.D.I.B., Jiribam, Coll. A.K.K. & party, 18.iii.93 (ii) 1 ex.,

37 mm, Khutikhong Fish Farm at Jiribam, Coll. A.K.K. & party, 18.iii.93.

Geographical Distribution : India.

Elsewhere : Pakistan; Nepal; Bangla Desh and Myanmar.

Fishery Information : It attains a length of 80 mm and is of no interest to fisheries but established itself as an aquarium fish.

Family MUGILIDAE

Genus *Sicamugil* Fowler, 1939

1939. *Sicamugil* Fowler, *Notul. Nat. Acad. Philad.*, 17 : 9 (type-species : *Mugil hamiltonii* Day).

Body robust and compressed. Head much flattened on dorsal side. A strong spine on operculum. Lips thin, lower lip with a symphyseal knob. First dorsal fin with 4 spines; second one with 1 spine and 8 soft rays. Anal fin with 3 spines and 8 to 9 soft rays. Scales 36 to 47 in longitudinal series.

132. *Sicamugil cascasia* (Hamilton)

1822. *Mugil cascasia* Hamilton-Buchanan, *Fishes of Ganges* : 217, 380 (type-locality : Northern rivers of Bengal).
1991. *Sicamugil cascasia* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 899, fig. 270.

Material examined : (i) 5 exs., 65-90 mm, Jiri River at Gopalthal village, 4 kms north of Jiribam, Coll. A.K.K. & party, 19.iii.93 (ii) 2 exs., 65-80 mm, Jiri river at Jiribam, Coll. W. Vishwanath, 1989.

Geographical Distribution : India : Ganga, Jamuna and Brahmaputra river systems.

Elsewhere : Pakistan and Bangla Desh.

Fishery Information : This mullet attains a length of about 110 mm, very common in the upper waters of Ganga and Jamuna and is of some interest to fisheries.

Family GOBIIDAE

Genus *Glossogobius* Gill, 1862

1862. *Glossogobius* Gill, *Ann. Lye. Nat. Hist. New York*, 7 : 46 (type-species : *Gobius platycephalus* Peters = *Gobius giuris* Hamilton-Buchanan).

Body elongate, anteriorly cylindrical, posteriorly compressed. Head depressed, pointed; scaled above behind eyes. Gill-openings from below rear of preopercle to below eyes. Isthmus narrow. Mouth slightly oblique; lower jaw prominent. First dorsal with 6 spines; second one with 1 spine and 6 to 10 soft rays. Pelvic fin united forming a disc. Caudal fin oblong to rounded. 28 to 36 scales along lateral series.

133. *Glossogobius giuris* (Hamilton)

1822. *Gobius giuris* Hamilton-Buchanan, *Fishes of Ganges* : 51, pl. 33, fig. 15 (type-locality : Gangetic provinces).
1991. *Glossogobius giuris* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 936.

Material examined : (i) 2 exs., 88-102 mm, Moirang Market, Coll. P.K. & party, 24.xi.91 (ii) 2 exs., 108-110 mm, Withou village, 15 kms from Imphal, Coll. P.K. & party, 23.xi.91 (iii) 5 exs., 95-118 mm, Imphal fish Market, Coll. P.K. & party, 25.xi.91 (iv) 3 exs., 110-138 mm, Thangal Market, Imphal, Coll. P.K. & party, 22.xi.91 (v) 2 exs., 95-125 mm, Bishenpur, Coll. P.K. & party, 27.xi.91 (vi) 5 exs., Nightingam, 35 kms from Imphal, Coll. P.K. & party, 26.xi.91 (vii) 1 ex., 140 mm, Khordak River, West of Keibul Lamjao Sanctuary, Coll. T.R. & party, 2.iii.92 (viii) 2 exs., 83-85 mm, Loktak Lake, Manipur, Coll. T.R. & party, 27.ii.92 (ix) 1 ex., 92 mm, Keibul Lamjao Sanctuary, Coll. T.R. & party, 1.iii.92 (x) 6 exs., 55-110 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xi.91 (xi) 2 exs., 97-120 mm, Thanga village, 50 kms from Imphal, Coll. P.K. & party, 28.ii.91 (xii) 1 ex., 128 mm, Moirang Fish Market, Coll. P.K. & party, 1.xii.91 (xiii) 4 exs., 63-120 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93 (xiv) 9 exs., 35-82 mm, Pachau Fish Breeding Farm, 5 kms south of P.W.D.I.B., Jiribam, Coll. A.K.K. & party, 18.iii.93 (xv) 2 exs., 55-118 mm, Khuga river, 2 kms east of Churachandpur Circuit House (Market coll.), Coll. A.K.K. & party, 10.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Nepal; Bangla Desh; Myanmar; Sri Lanka. It has a wide range of distribution from the East coast of Africa to Japan. Australia and South Pacific.

Fishery Information : It attains a length of about 300 mm and forms a minor fishery specially in the Hooghly Estuary, West Bengal.

Family ANABANTIDAE

Genus *Anabas* Cuvier & Cloquet, 1816

1816. *Anabas* Cuvier and Cloquet, *Dictionnaire des sciences naturelles* (ed 2), 2, Suppl. : 35 (type-species : *Perca scandens* Daldoff = *Anthias testudineus* Bloch).

Body oblong and compressed. Head and anterior part of body broad, posterior portion compressed. Mouth small, terminal; upper jaw slightly protrusile. Dorsal inserted above pectoral fin base, with 16 to 18 spines and 8 to 10 soft rays. Anal fin with 8 to 10 spines and 9 to 11 soft rays. Caudal fin rounded. Lateral line interrupted with 21 to 29 ctenoid scales.

134. *Anabas testudineus* (Bloch)

1795. *Anthias testudineus* Bloch, *Naturges Ausland Fische*, (6) : 121, pl. 322 (type-locality : ? Java).
1991. *Anabas testudineus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 996-998.

Material examined : (i) 1 ex., 91 mm, Withou village, 15 kms from Imphal, Coll. P.K. & party, 23.xi.91 (ii) 1 ex., 115 mm, Pond at Nampal, Coll. T.R. & party, 26.ii.92.

Geographical Distribution : India.

Elsewhere : Pakistan; Bangla Desh; Sri Lanka; Myanmar; Malay Archipelago; Singapore; and Philippines.

Fishery Information : It attains a length of 200 mm and is of considerable fisheries interest. Despite its moderate size, this fish is regarded as a highly esteemed fish for its flavour, restorative values and prolonged freshness.

Family BELONTIDAE

Genus *Colisa* Cuvier, 1831

1831. *Colisa* Cuvier, *Hist. nat. Poiss.*, 7 : 359 (type-species : *Trichopodus colisa* Hamilton-Buchanan = *Trichogaster fasciatus* Schneider).

Body oblong and compressed. Mouth small, terminal, upwardly directed and protrusile. Ventral

border of preopercle serrated. Dorsal fin long, with 15 to 18 spines and 6 to 14 soft rays. Anal fin with 15 to 22 spines and 11 to 20 soft rays. Pelvic fin in the form of a single elongated filliform ray. Caudal fin slightly emarginate or truncate. Lateral line when present interrupted with 27 to 31 scales.

Key to the species of Genus *Colisa*

1. Body with a single black longitudinal band from eye to lower half of tail *C. sota*
- Body with many oblique bands from back to belly 2
2. Bands on body 8 to 10. Caudal fin wedge shaped *C. labiosus*
- Bands on body 14 or more. Caudal fin cut square or slightly notched *C. fasciatus*

135. *Colisa fasciatus* Schneider

1801. *Trichogaster fasciatus* Schneider, *Syst. Ichth.* : 164, pl. 36 (type-locality : Tranquebar).

1991. *Colisa fasciatus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 1006.

Material examined : (i) 1 ex., 81 mm, Takmu Lake, Coll. T.R. & party, 29.ii.92 (ii) 2 exs., 65-66 mm, Thanga village, 50 kms from Imphal, Coll. P.K. & party, 28.xi.91 (iii) 3 exs., 80-110 mm, Khutikhong Fish Farm at Jiribam, Coll. A.K.K. & party, 18.iii.93 (iv) 9 exs., 30-71 mm, Takmu Fish Farm, Loktak Lake, Coll. A.K.K. & party, 13.iii.93. (v) 1 ex., 74 mm, Khuga river near Churachandpur (Market Coll.), Coll. A.K.K. & party, 10.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Nepal; Bangla Desh and Upper Myanmar.

Fishery Information : It is a beautiful aquarium fish and easily bred and adopts well to life in community aquaria. It attains a length of about 120 mm and is traditionally liked in West Bengal for its good taste.

++136. *Colisa labiosus* (Day)

1876. *Trichogaster labiosus* Day, 1876, *Fishes of India*, : 374, pl. 79, fig. 4 (type-locality : Rangoon, Myanmar).

1991. *Colisa labiosus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 1006-1007.

Material examined : (i) 3 exs., 38-72 mm, Moirang Market, Coll. P.K. & party, 24.xi.91 (ii) 5 exs., 65-70 mm, Withou village, 15 kms from Imphal, Coll. P.K. & party, 23.xi.91 (iii) 6 exs., 37-75 mm, Imphal Fish Market, Coll. P.K. & party, 25.xi.91 (iv) 5 exs., 40-71 mm, Thangal Market, Imphal, Coll. P.K. & party, 22.xi.91 (v) 1 ex., 70 mm, Bishenpur, Coll. P.K. & party, 27.xi.91 (vi) 2 exs., 67-72 mm, Nightingam, 35 kms from Imphal, Coll. P.K. & party, 26.xi.91 (vii) 6 exs., 33-71 mm, keibul Lamjao Sanctuary, Coll. T.R. & party, 1.iii.92 (viii) 2 exs., 90-130 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xi.91 (ix) 1 ex., 50 mm, Floating Sanctuary, Keibul, Coll. T.R. & party, 3.iii.92.

Geographical Distribution : Elsewhere : South Myanmar (new record from India : Manipur).

Fishery Information : It attains a length of about 70 mm. A colourful aquarium fish, well behaved in community aquaria.

137. *Colisa sota* (Hamilton)

1822. *Trichopodus sota* Hamilton-Buchanan, *Fishes of Ganges*, : 120, 373 (type-locality : Ganges river).

1991. *Colisa sota* Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, : 1007-1008.

Material examined : 1 ex., 41 mm, Bishenpur, Coll. P.K. & party, 27.xi.91 (ii) 2 exs., 36-40 mm, Nightingam, 34 kms from Imphal, Coll. P.K. & party, 26.xi.91 (iii) 3 exs., 38-41 mm, Thoubal Fishing Centre, Coll. P.K. & party, 29.xi.91 (iv) 1 ex., 47 mm, Khutikhong Fish Farm at Jiribam, Coll. A.K.K. & party, 18.iii.93.

Geographical Distribution : India : Gangetic provinces and Assam, Manipur.

Elsewhere : Bangla Desh.

Fishery Information : It attains a length of about 50 mm. This is a uncommon species and is of no interest to fisheries.

Order MASTACEMBELIFORMES

Family MASTACEMBELIDAE

Genus *Mastacembelus* Scopoli, 1777

1777. *Mastacembelus* Scopoli, *Introductio Historiam Naturalem* : 458 (type-species : *Ophidium mastacembelus* Solander).

Body elongate, eel-like and compressed. Mouth inferior, cleft narrow. The long fleshy appendage of the snout not transversely striated below. Pre-orbital spine present. Dorsal fin inserted above middle of pectoral fin, with 24 to 39 detached spines and 50 to 90 soft rays. Anal fin with 3 spines and 31 to 98 soft rays. Dorsal and anal fins may or may not be confluent with caudal fin, which is rounded. Lateral line present.

Key to the species of Genus *Mastacembelus*

1. Preopercular spine absent. *M. caudiocellatus*
– Preopercular spine present, sometimes hidden beneath the skin 2
2. Dorsal fin with 24 to 30 spines and 30 to 42 rays. Dorsal and anal fins separate from caudal fin..... *M. pancalus*
– Dorsal fin with 32 to 40 spines and 64 to 92 rays. Dorsal and anal fins broadly joined to caudal fin..... *M. armatus*

139. *Mastacembelus armatus* (Lecepede)

1800. *Macrogathus armatus* Lacepede, *Hist. nat. Poiss*, 2 : 286 (type-locality : not known).
1991. *Mastacembelus armatus* : Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries* : 1031-1032.

Material examined : (i) 1 ex., 370 mm, Moirang Market, Coll. P.K. & party, 24.xi.91 (ii) 1 ex., 250 mm, Loktak Lake, Coll. T.R. & party, 27.ii.92 (iii) 1 ex., 250 mm, Thanga village (Loktak Lake coll.), Coll. A.K.K. & party, 13.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; Sri Lanka; Nepal; Myanmar; through Thailand and Malaya, to south China.

Fishery Information : It attains a length of about 650 mm and is the largest spiny eel. It is reported to be a good food fish specially when freshly caught.

++140. *Mastacembelus caudiocellatus* Boulenger

1893. *Mastacembelus caudiocellatus* Boulenger, *Ann. Mag. nat. Hist.*, (5) 12 : 159 (type-locality : Fort stedman, Inle Lake basin, Myanmar).

1981. *Mastacembelus caudiocellatus* Jayaram : *Freshwater Fishes of India, Pakistan, Bangla Desh, Myanmar and Sri Lanka* : 389.

Material examined : (i) 1 ex., 240 mm, Rangazak stream, 15 kms north of Ukhrul, Coll. A.K.K. & party, 9.iii.93.

Geographical Distribution : (First record from India : Manipur).

Elsewhere : Myanmar : Inle Lake Basin, Shan States

Fishery Information : This species attains a length of 240 mm and is of no interest to fisheries in Indian region.

141. *Mastacembelus pancalus* (Hamilton)

1922. *Macrogathus pancalus* Hamilton-Buchanan, *Fishes of Ganges*, : 30, 364, pl. 22, fig. 7 (type-locality : tanks of Gangetic provinces).
1981. *Mastacembelus pancalus* Jaytaram, *The Freshwater Fishes of India, Pakistan, Bangla Desh, Myanmar and Sri Lanka*, : 389.

Material examined : 20 exs., 61-100 mm, Pachau Fish Breeding Farm, 3 kms south of P.W.D.I.B., Jiribam, Coll. A.K.K. & party, 18.iii.93.

Geographical Distribution : India : throughout.

Elsewhere : Pakistan; and Bangla Desh.

Fishery Information : This species attains a length of 180 mm and is of little commercial importance. It is often used as an aquarium fish.

SUMMARY

An attempt has been made in this present study to provide an upto date classification, nomenclature including both scientific and local names, details of material studied, size-ranges, distributional records, fishery information along with a species identification key under each genera. During the preparation of this faunal work, we have made use of all the earlier informations available in the literature in addition to the study of the fish material collected by three extensive field surveys recently conducted by Zoological Survey of India survey parties; fish specimens received from Dr. W. Viswanath Singh, Manipur University; and also earlier identified

collection available in National Zoological Collection. The fish collection show Assamese, endemic and Burmese elements. The Assamese elements are observed in the southern part of the Brahmaputra Drainage System while endemic and Burmese elements are found in the eastern part including the valley which is drained by the Chindwin Drainage System. In all 141 species belonging to 9 orders, 24 families and 64 genera have been dealt with in detail in this work. Out of these 10 species under 9 genera are recorded for the first time from Manipur and 4 species under 4 genera are recorded for the first time from India. A map showing drainage system and collecting stations has also been included.

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REFERENCES

- ANAL, B.L. and ANAL, S.P. 1991. Ichthyofauna of Chakpi river, Chandel district (Manipur) with special references to eco-biology of *Tor tor* (Ham.). *Journal of I.F.T.C.*, Lamphel, Manipur, **1** : 66-81.
- ANNANDALE, N. and HORA, S. L. 1921. The Fauna of Loktak Lake in Manipur. *Proc. Indian Sci. Congr. Calcutta* (N.S.), **17** : 147.
- BARMAN, R.P. 1987. On a new Cyprinid fish of the genus *Danio* Hamilton (Pisces : Cyprinidae) from Manipur, India. *J. Bombay Nat. Hist. Soc.*, **84**(1) : 172-174.
- CHAUDHURI, B. L. 1912. *Nemachilus manipurensis* sp. nov. (Pisces : Cyprinidae) from freshwater of Manipur. *Rec. Indian Mus.*, **7** (5) : 443, pl. 40, figs. 4, 4a & 4b, pl. 41, figs. 1, 1a & 1b.
- DATTA, A.K., KARMAKAR, A.K. and LAISHRAM, I.S. 1984. *Acrossocheilus manipurensis* sp. nov. (Pisces : Cyprinidae) from Manipur, India. *Bull. zool. Surv. India*, **6** (1-3) : 167-170, fig. 2.
- DAY, F. 1878. *The Fishes of India, being a natural history of the fishes known to inhabit the seas and freshwaters of India, Myanmar and Ceyon*. XX 778 pp, 195 plates. Taylor & Francis, London.
- GREENWOOD, P.H., ROSEN, D.E., WEITZMAN, S.H., MYERS, G.S. 1966. Phyletic studies of teleosteam fishes with a provisional classification of living forms. *Bull. Am. Mus. nat. Hist.* New York, **131** : 339-456, pls. 21-23.
- HAMILTON, F. 1822. *An account of the fishes found in the river Ganges and its branches*. viii + 405 : 39 pls, Edinburg & London.
- HORA, S.L. 1921. Fish and Fisheries of Manipur with some observations on those of the Naga Hills. *Rec. Indian Mus.*, **22**(3) : 165-214, 4 pls.

- HORA, S.L. 1936. On a further collection of fish from Naga Hills, *Rec. Indian Mus.*, **38** : 318-331.
- HORA, S.L. and MUKHERJEE, D.D. 1935. Fish of the Naga Hills, Assam. *Rec. Indian Mus.*, **37** : 381-404.
- JAYARAM, K.C. 1981. *The Freshwater Fishes of India, Pakistan, Bangla Desh, Myanmar and Sri Lanka—A Handbook*, Zoological Survey of India, pp. 1-475, 13 plates.
- JAYARAM, K.C. 1991. Revision of the genus *Puntius* Hamilton from the Indian Region (Pisces : Cypriniformes, Cyprinidae, Cyprininae). *Rec. zool. Surv. India, Occ. Paper No.* **135** : 1-178.
- MENON, A.G.K. 1954. Further observatins on the fish fauna of the Manipur state. *Rec. Indian Mus.*, **52**(1) : 21-26.
- MENON, A.G.K. 1987. *The Fauna of India and the adjacent Countries*, Pisces, Vol. **IV**, Part 1 (Teleostei—Cobitoidea—Homalopteridae) : 1-259, 16 plates, Zoological Survey of India.
- MENON, A.G.K. 1992. *The Fauna of India and the adjacent Countries*; Pisces, Vol. **IV**, Part 2, (Teleostei—Cobitoidea—Cobitidae) : 1-113, 10 plates, Zoological Survey of India.
- MENON, M.A.S. 1952. On a collection of fish from Manipur, Assam. *Rec. Indian Mus.*, **50**(2) : 265-270.
- NIRMALA Devi, W. and VAIPHEI, N. 1991. Observations on Fisheries of Loktak Lake and adjacent wetland areas with special reference to some commercially important indegenous fishes. *Journal of I.F.T.C., Lamphel, Manipur*, **1** : 48-59.
- PARDHASARADHI, A. and ALFRED, J.R.B. 1985. A longitudinal and altitudinal distribution of fish in two hill streams of N.E. India, *Matysa No.* **9-10** : 60-69.
- PILLAI, R.S. and YAZDANI, G.M. 1972. First record of the catfish, *Olyra horai* Prashad & Mukherjee (Siluriformes : Olyridae) from Indian water with brief redescription of the species. *J. zool. Soc. India*, **23**(2) : 136.
- SEN, T.K. 1985. The Fish Fauna of Assam and the neighbouring North-eastern states of India. *Rec. zool. Surv. India, Occ. Pap. No.* **64** : 1-216.
- SHAW, G.E. and SHEBBEARE, E.O. 1937. The Fishes of Northern Bengal. *J. Royal Asiat. Soc. Bengal (Science)*, **3**(1) : 1-137, 6 pls., 130 text figs.
- SINGH, W.V. and SAROJNALINI, C. 1988. A new Cyprinid fish, *Garra manipurensis*, from Manipur, India. *Japan J. Ichthyol.*, **35**(2) : 124-126.
- SINGH, W.V. and SINGH, H.T. 1985. On a collection of fishes from Tengnoupal district of Manipur with some new records. *Intl. J. Acad. Ichthyol. (Proc. V. AISI)* **6** : 85-90.
- SINGH, W.V. and SINGH, H.T. 1986. First record of the Bagrid Fish *Mystus microphthalmus* from India. *Japan. J. Ichthyol.* **33**(2) : 197-199.
- SINGH, W.V. and SINGH, H.T. 1986. A new species of the genus *Puntius* Hamilton from Manipur. *Rec. zool. Surv. India*, **83** (1&2) : 129-133.
- SINGH, W.V. and SINGH, H.T. 1987. On a collection of some endemic fishes from Manipur. *Proc. nat. Acad. Sci. India*, **57**(B), II : 109-115.
- SINGH, W. Vishwanath, et al. 1987. First records of freshwater fishes *Garra gravelyi* and *G. kempi* in Manipur. *Indian J. Fish.*, **34** (No. 3) : 362-364.

- TALWAR, P.K. and JHINGRAN, A.G. 1991. *Inland Fishes of India and Adjacent Countries*. (Vols. 1 & 2) : 1-1158, figs. 301, Oxford & IBH Publishing Co. Pvt. Ltd.
- TILAK, R. and HUSSAIN, A. 1981. On the systematics of the Indian fishes of the genus *Lepidocephalus* Bleeker with a key to the species and the genus and the genera of the subfamily Botiinae and Cobitinae (Cobitidae : Cypriniformes). *Rec. zool. Surv. India, Occ. Paper No.* 32.
- TILAK, R. & HUSSAIN, A. 1989. Description of a new cyprinid *Osteobrama brevipectoralis* sp. nov. from Manipur, India with remarks on the systematic position of the genus *Osteobrama* Heckel and allied genera. *Mitt. Zool. Mus. Berl.* 65(2) : 327-333, illustr. (English).
- TILAK, R. and HUSSAIN, A. 1990. Description of a new loach, *Nemacheilus chindwinicus* sp. nov. (Homalopteridae, Cypriniformes) from Manipur, India with notes on the systematic status of the genus *Nemacheilus* and the subfamily Nemacheilinae. *Mitt. Zool. Mus. Berl.* 66(1) : 51-58, illustr. (in English).
- TILAK, R. and JAIN, S. 1989. Description of a new rasborinae fish *Esomus manipurensis* from Manipur, India, *J. Bombay nat. Hist. Soc.*, 86(3) : 408-411, illustr.

ANIMAL FOSSILS

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INTRODUCTION

The State of Manipur is situated in the extreme north-eastern part of India. It is predominantly a hilly terrain, but there is a small plain of alluvial soil in its central part. In past, the Tethys sea continued to receive sediments of conglomerates, shales, sandstones and limestones, eroded from the Archaean rocks, during the Palaeozoic and much of the Mesozoic period. This geological unit underwent an orogenic activity in the late Cretaceous and early Caenozoic period that influenced the geographic and tectonic alignments of the region and established a new pattern of sedimentation. This orogeny was accompanied by extensive igneous activity. The Shan plateau was uplifted in the east and a narrow belt along the west, which marked the beginning of a tectonic highland of Arakan-Yoma and Naga Hills. In this region, rocks of upper Cretaceous to the present alluvium are found. Rock units exposed in the Manipur-Nagaland Hills can be broadly grouped from west to east, representing various stages of basin evolution and orogeny into the following (Chungkham & Jafar, 1998) :

Facies	Lithounits
Molasse	Barail Group
Flysch	Disang Formation
Olistostromal deposits	Mélange zone
Ophiolite suite	Oceanic Pelagic sediments, Manipur Ophiolite / Nagaland Ophiolite
Metamorphic	Naga Metamorphic Complex

Structurally, each of these units is overthrust by the next from the east and folded all together. The flyschoid Disang Formation gradually merges into the postorogenic mollasic Barail Group of rocks towards the west (Fig. 1). The olistolithic blocks of pelagic limestones and chert could hitherto be dated as Late Cretaceous (Late Santonian to Late Maestrichtian) (Acharyya *et al.*, 1986; Mitra *et al.*, 1986; Chungkham & Caron, 1996). A number of fossil beds are exposed, especially along the eastern part of the territory (Figs. 2 & 3). The exploration and updating of records of animal fossils from Manipur were a part of the programme of the preparation of an exhaustive faunal atlas of the State by the ZSI.

PHYSIOGRAPHIC SETTING

Situation and greater surroundings : Manipur is situated in the northeastern corner of the country between 23°50' and 25°41' North latitudes and 93°2' and 94°47' East longitudes and covers an area of about 22,329 sq km. The State is bounded on the west by Nagaland, on the south by Mizoram, on the west by Assam and on the east by Myanmar. The oval shaped central plain has an area of about 1765 sq km. Out of about 885 km. boundary line of the State, approximately 352 km. form international border with Myanmar.

Topographic characteristics : There are two main relief features in Manipur namely, hills and plains. Hills cover about 92 per cent of the total

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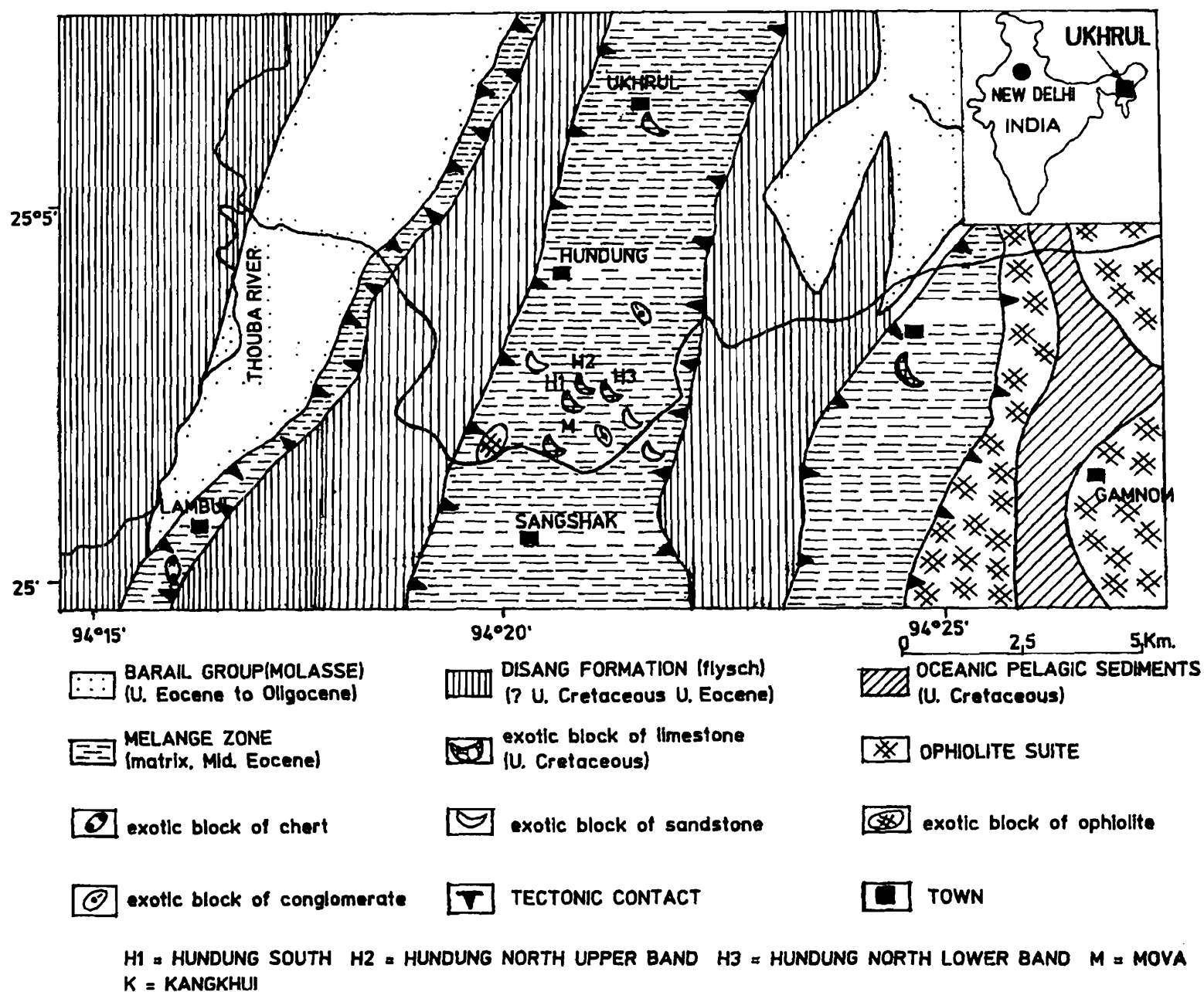


Fig. 1. Geological map of area around Ukhrul (modified after Khan & Gupta, 1990).

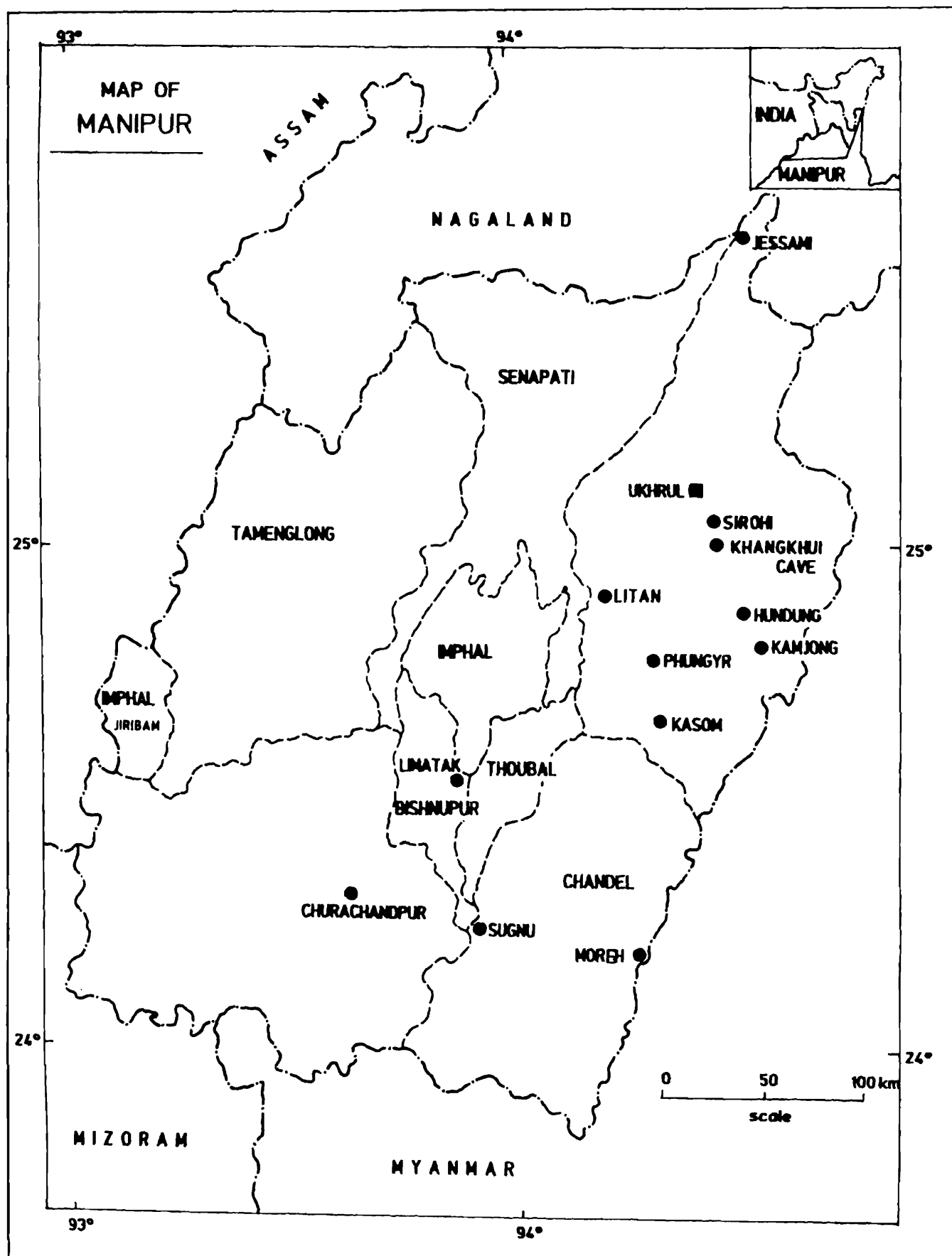


Fig. 2. Sketch map showing prospective fossil beds in Manipur (solid rounds and square).

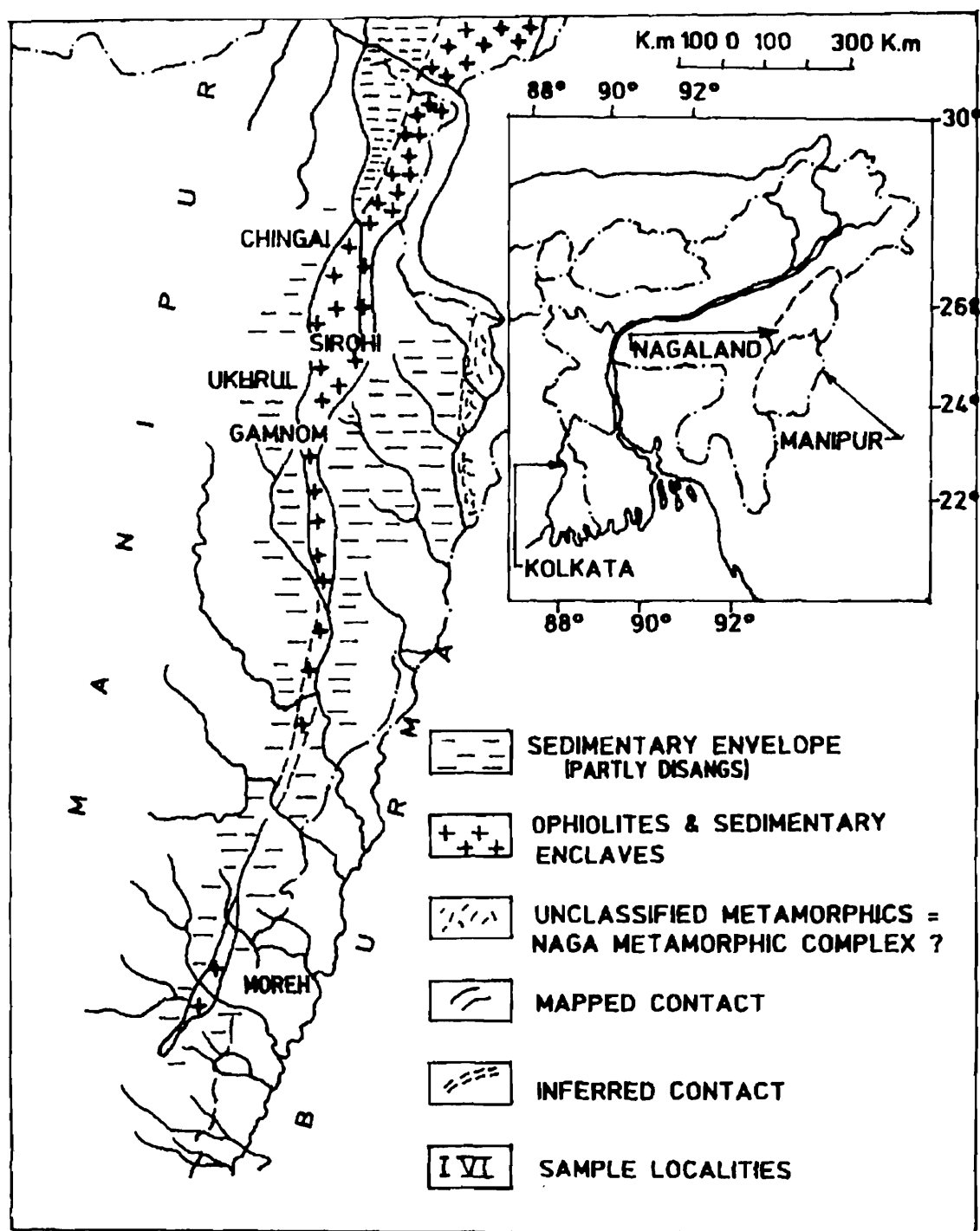


Fig. 3. Map of Naga Hills ophiolite with its envelope and enclaves showing fossil localities (After Ghosh *et al.*, 1984).

geographical area of the State and they stretch northeast-southwest as parallel folds with altitudes varying between 762 m (200 ft.) and 3048 m (10,000 ft.) above msl. They are part of Assam-Myanmar Tertiary ranges, which sweep in a long curve from the northeastern corner of Assam to Cape Negaris of Myanmar. The Central plain is a small, high level plain, at an altitude of about 792 m (2600 ft.) above msl. The whole of Assam-Arakan Tertiary belt has undergone strong folding, and long anticlinal axes can sometimes be followed for some long distance, the more sharply folded ones are associated with thrust faults. Though some anticlinal crests remain at the surface, they have usually been removed by thrusting. In the hills between Manipur valley and Cachar of Assam, folding is more dominant than faulting and asymmetrical anticlines are separated by broader synclines. The appearance of the mountain belt is that of a succession of long parallel ranges separated by deep valleys; still further south the whole belt gradually narrows forming the Arakan Yomas.

The hill ranges have occasional connecting spurs and ridges of lower elevation between them. Their highest altitude is attained in the north near Mao, close to Manipur-Nagaland border (on Mount Japvo) The Japvo range sends out numerous spurs towards the east and west. From this point southwards there is a steady decrease in the height of the hill ranges. Along the eastern part of Manipur through which runs the Indo-Myanmar border, there are series of ranges through which the rivers have passed to the valley.

The central plain or the valley of Manipur is the most striking topographic feature in a mountainous State. It is roughly oval in shape, irregular in outline and about 57.9 km long (in N-S axis) and 32.1 km wide (in E-W axis). It is a flat plain surrounded by hills or mountains. The plain extends right up to the foot of the bordering range where the slope abruptly changes. The plain slopes from north to south. The lowest part of the plain is occupied by the Loktak lake. The plain however, is dotted by a few hillocks.

Natural drainage : The State lies in the catchment area of two river systems namely,

Ganga-Brahmaputra and Chindwin-Irrawaddi. The western half of the State falls in the catchment of the former and the remaining eastern half including the central plain lies in the catchment of the later. In general, the rivers occupy parallel valleys separated by parallel ranges except where they have cut transverse valleys. They carve out very narrow V-shaped valleys. The rivers of the valley take their rise in the hills towards north. On the east is the Thoubal river, which rises in the hills not far from Ukhrul. West of Thoubal is the Iril, which rises about 24.1 km east of Maram, and after skirting the town of Imphal falls, like Thoubal, into the Imphal river. Through the capital town itself flow the Imphal and Nambol rivers. The Nambol falls into the Loktak, from which it emerges under the name of Kortak. This stream eventually joins the Imphal, and another river called Nambol, which rises near Kangjupkul and flow to the west of Imphal and Loktak. Their united waters, which are known as Achauba, Imphal or Manipur river, finally fall into the Kendat and thus into the Chindwin. In the cold weather these rivers are shallow, muddy streams, creeping along the bottom of the deep channels which they have cut through the alluvium. But in times of flood during monsoon they rise to a considerable height and sometimes overtop their banks. In the eastern hills there are numerous small streams which drain into the Yu and thence into the Chindwin. The principal rivers of the western hills are the Barak and its tributary, the Irang. The Barak rises about 16.1 km from Mao Thana, and flows a westerly course as far as Kairong. Here it takes a bend towards north, and then turns westward, till it reaches the north-west corner of the State. The river then curves away towards south and flows to Tipaimukh, which till lately was the tri-junction point of Manipur, Cachar and Lushai Hills. At Tipaimukh, the Barak turns sharply to the north, and as far as Jirighat. In this portion of its course it forms boundary between Cachar and Manipur. Two other rivers of some importance are the Jiri and the Makru, while coming from Cachar to Manipur.

The Loktak is the largest sheet of water, and is said to be 12.9 km long and 8 km. wide at the

broadest part. It is a broad, shallow sheet of water.

Soilscape : The physical composition of soil is generally loose and hence it does not hold water. On exposed hill slopes the combination of tropical sun and torrential rains cause leaching of minerals from the soils. Soils are generally light except in the river valleys where silt accumulates. Perpetual burning of vegetation due to shifting cultivation, in some parts of the hills, has rendered the soil devoid of humus. The soils of the central plain are greatly transported from the surrounding hills through rains and contain high proportion of clay.

Climatic condition : The State enjoys a typical monsoon climate with variants ranging from tropical to temperate conditions. The rapid changes in topography result in climatic changes within short distance. There are two seasons separated by two short transitions. From November to February is the period of winter. The summer commences in April and continues up to September. The summer season is also the period of rains. The October is the period of transition between the summer and winter, so is the month of March between the winter and summer. The temperature in the central plain seldom touches freezing point, nor at any time of the year it is too hot. Hill areas are much cooler. The rains commence in April and continue up to September. The period from June to September accounts for more than half of the annual rainfall. There is little rain during December and January. The rainfall is high and well distributed, over both time and space.

GEOLOGY AND STRATIGRAPHY

General Geology

The rock formations occurring in the State are the Cretaceous limestone, the Disangs with serpentinites (Lower and Middle Eocene – Upper Cretaceous), the Barails (Upper Eocene and Oligocene, the Surmas and the Tipams (Miocene).

A brief account of the rock types in the eastern hills of the State was given by

Bhattacharya & Bhattacharya (1984). The rock types in this part consist mainly of sandstone and shale siltstone, geosynclinal flysches with minor bands of greywacke. These flysches also show presence of irregular blocks of limestone, conglomerate, calcareous sandstone, greywacke, serpentinite and chert. These sedimentary, to the east, is further tectonically overlain by a host of gabbro-ultrabasics to basics ranging from serpentinite, peridotite, basic volcanics and diorite.

The limestone etc. was earlier referred to as Cretaceous bed (Oldham; 1883; Pascoe, 1912; Raina, 1959) or Ukhrul bed (Nandy & Sriram, 1970; Ghosal, 1972). The slightly metamorphosed sandstone and shale-siltstone flysches were classified by the earlier workers as the Disang Series (Oldham, 1883; Pascoe, 1912; Raina, 1959, Nandy & Sriram, 1970; Ghosal, 1972).

Details of the Disang and Barail Groups as well as the ophiolitic sediments exposed in Manipur East (Ukhrul) and Chandel Districts are given below:

Disang Group : It was first described by Mallet (1876) as 'Disang Series' which consists of a great thickness of splintery grey shales interbedded with fine grained sandstones. Towards upper part, it passes into a sequence of thinly bedded sandstone. The type of Mallet is located in Dilli (Disang) river in Upper Assam where the lowest beds are almost entirely dark grey shales (Evans, 1932). A large tract of the interior hills of Manipur is occupied by the Disang Group of rocks. Tectonically, this part of Disang country is known as 'Inner Palaeozoene fold belt' being constituted by alternately disposed large synclinal ridges and intervening anticlinal valleys. The Disang rocks are not yet known from NW of Haflong – Disang thrust (Evans, 1932). In Manipur the Disang rocks consist of a monotonous sequence of dark grey, splintery shales (Pascoe, 1912). The interbedded sandstones, and also the sandstones towards the top, are sub-greywacke, greywacke or lithic arenites. At some places the shale/siltstone sequence is metamorphosed into phyllites and slates. The Disangs have a thickness

of approximately 300 m. (Mathur & Evans, 1964) though it is difficult to estimate the exact thickness because of tightly and repeatedly folded nature of its strata as well as due to intermittent dissection by a series of thrusts and faults.

In Manipur-Nagaland, the Disang has been subdivided into two Formations namely, (i) Lower Disang, and (ii) Upper Disang Formations. The Lower Disang Formation consists mainly of argillaceous lithounits such as phyllitic shales, phyllites, slates and slaty shales with interbedded minor sandstones/siltstones. It is usually devoid of any megabiota but fragmentary leaf impressions of Graminae are quite common indicating sedimentation in a distal shelf facies. The Upper Disang Formation, which lies unconformably over the Lower Disang Formation, comprises a rhythmite sequence of alternate shale/siltstone and sandstone beds. The olistostromal biozones containing olistoliths of limestone, chert, sandstone, calcareous sandstone and siltstone are well exposed in the eastern part of Manipur. The Disang Group is overlain by the Laisong Formation of the Barail Group.

Barail Group : The name 'Barail' was taken from the Barail range (formerly Bor Ali range) which forms the backbone of the North Cachar Hills in Assam. The part of the range north of Silchar is regarded as the type area of the Barail Group (Evans, 1932) but the type section is provided by the Jenam river. Conformably, overlying the Disang the Barail rocks occur in the Kohima synclinalorium in the Schuppen belt as tectonic slices and in the Inner Palaeogene fold belt along with cherts of the synclinal ridges in Manipur. The subdivisions of the Barail Group as given by Evans (1932) is cited below (Table 1).

Laisong Formation : It is the lower subdivision of the Barail Group, about 200 m. to 2500 m. in thickness and consists largely of very hard, thin bedded, indurated, grey sandstones alternating with hard sandy shales. Some of the best exposures in Assam are observed in the Jatinga and Jenam river sections near Laisong in North Cachar Hills district (Evans, 1932). There is no distinguishable boundary between the Disang shales and the overlying arenaceous alternations at the base of Laisong Formation. The boundary is conformable

Table 1 : Subdivisions of Barail Group (after Evans, 1932)

Stage	Lithology	Thickness
Renji Formation (883 m.)	Bedded sandstone	215 m.
	Massive sandstone	396 m.
	Bedded sandstone	152 m.
	Massive sandstone	122 m.
	Bedded sandstone, sandy shale	122 m.
	Carbonaceous shale	
Jenam Formation (1,259 m)	Shale, thin bedded sandstone and sandy shale	213 m.
	Shale bedded sandstone	366 m.
	Shale and sandy shale	244 m.
	Bedded and thin bedded sandstone, shale and sandy shale	305 m.
Laisong Formation (2,483m.)	Bedded and thin bedded sandstone with some shale and sandy shale	488 m.
	Shale with thin bed and bedded sandstone	518 m.
	Thin bedded and bedded sandstone with shale	305 m.
	Bedded and thin bedded sandstone	670 m.
	Bedded sandstone, shale, sandy shale	457 m.

and, in general, the incompetent Disangs are more contorted in nature than the Barails which contain competent beds. In eastern Naga Hills and Manipur, the Laisong Formation is at places underlain by a ferruginous nodule-bearing horizon of upper Disang Formation. The Laisong rocks occur in the Schuppen belt, Kohima synclinorium (SW of Kohima), and Inner Palaeogene fold belt of Manipur–Nagaland along the top of the synclinal ridges.

Jenam Formation : The Laisong Formation passes upward into a more argillaceous lithoformation known as Jenam Formation which consists of shale, sandy shale and carbonaceous shale with beds of sandstones which are relatively thin-bedded. There are occasional streaks, lenses, and beds of coal associated with this Formation.

The best section of this Formation occurs in the Jenam river in the North Cachar Hills district (Assam). The thickness of the Formation is about 700m. to 1200m. On Mariani–Mokokchung road section, the Jenam Formation has a thickness of about 750 m.

The Jenam Formation conformably overlies the Laisong Formation and underlies the Renji Formation of the Barail Group. The Jenam Formation occurs mainly in the belt of Schuppen, Chingtang Saddle-Konya syncline, and Kohima synclinorium. This Formation has not yet been reported from the Inner Palaeogene fold belt of Nagaland and Manipur except in the area occupied by Konya syncline. Well developed sections of

the Jenam Formation occur in Changki-Chongliymisen sector of the Schuppen belt where thick coal seams measuring up to 2 m in thickness are seen to the west of Chanki village. It is observed that the development of workable coal seams is restricted to the Jenam Formation in the Northern part of the Schuppen belt.

Renji Formation : Overlying the soft sediments of the Jenam Formation there occurs a great thickness of hard, ferruginous, massive to thick bedded, multistoried sandstone with small proportion of shale/sandy shale known as Renji Formation. The sandstones exhibit large-scale current bedding, ripple marks and sole markings. The Formation constitutes the hills known as Renji Hills to the north of Badarpur in Cachar district.

The Surma and Tipam Groups occur in the western margin of the state and are represented by argillaceous and arenaceous sequences respectively and separated by a major anticline formed of the Cretaceous limestone in between. Within the synclinoria, the synclines form ridges and the anticlines valleys.

The regional strike of all the rock formations in Manipur varies between north-south and north-east to south-west. The Patkai and Kohima synclinoria continue southward into Manipur and form part of the folded and faulted belt known as Burmese arc.

Stratigraphy :

Sinha *et al.* (1982) had put forward the sequence of rock formations in the Manipur State as follows :

		Probable Equivalents
Mio – Pliocene	.....	Tipam Group
Miocene	.....	Surma Group
Oligocene to Upper Eocene	.....	Barail Group
Lower to Middle Eocene	.....	Disang Group with = Jaintia Group
to		serpentinities
Upper Cretaceous		Cretaceous limestone = Axial Group of Burma.

The following stratigraphic succession for the eastern part of Manipur was presented by Bhattacharya & Bhattacharya (1984) :

Group	Formation	Rock Units	Age
	Sirohi Formation	Mainly consisting of igneous suite of rocks ranging from ultrabasic to basic, viz., Serpenti-nite, Coarse grained and Altered Periodotite, Dunite, and basic Volcanics, Diorite with minor metamorphosed or enites and argillites	Early Eocene-Late Cretaceous
----- Thrust -----			
Disang Group	Ukhrul Formation	Essentially shale-siltstone of flysch facies, poorly fossiliferous, exhibiting presence of exotic blocks argillaceous limestone (Cretaceous) having marly intercalations, chert, calcareous sandstone, greywacke (ages not known) and serpentinites and holocrystalline diabase (possibly late Cretaceous/Early Eocene age)	Miocene
----- Thrusted -----			
	Lamlang Formation	Predominantly a sandstone flysch consisting of greywacke, feldspathic Eocene and Calcareous sandstone with argillites, poorly fossiliferous	Paleocene-Eocene

Lamlang Formation : This Formation is predominantly a sandstone flysch. The main rocky types consist of alteration of greywacke with minor coarse sandstone and fine sandstone. Presence of thinly bedded feldspathic sandstone, calcareous sandstone, grey shale and impersistent pebbly horizons are also present. The assemblage, in general, is poorly fossiliferous with the exception of calcareous sandstones and grey shale association which is rich in lamellibranchs and gastropods.

The greywackes are buff to grayish brown in colour. Thin impersistent minor pebbly/bouldery bands are noted within this horizon only. The fine sandstone is buff or grayish brown in colour and exhibits rhythmic and ripple mark. The intercalated siltstone bands are ferruginous/pyriteous, darkish in colour, and exhibits load casts, convolutes etc. Occasional presence of exotic blocks of serpentinite and calcareous

sandstone is also noted within this Formation. This Formation is well exposed along the road section from Litan to Lamlang on Imphal-Ukhrul road from 40 km post to 60 km post.

Ukhrul Formation : Lamlang Formation is overlain (tectonically) by the Ukhrul Formation. The main constituent is alteration of thick sequence of shale and siltstone with minor calcareous sandstone and silty sandstone. The shale is darkish in colour, occasionally carbonaceous as well as splintery. Siltstone/Silty-sandstone is grayish in colour and flaggy and shows graded bedding. The calcareous sandstone is hard and compact and buff in colour.

The roofless exotic blocks consist of argillaceous limestone, calcareous sandstone, conglomerates, greywacke, chert and serpentinite of which limestone exotics constitute the major part. Conglomerate exotic blocks consists mostly of boulders and pebbles of chert, jasper, quartzite,

greywacke siltstone, embedded in an otherwise siliceous, arenaceous or argillaceous matrix. Within these conglomerates, bands of mudstone and ferruginous shale have been traced. All these exotic blocks show divergent trend.

This Formation is exposed between Sirohi-Ukhrul-Hundung-Sangsak area.

Sirohi Formation : Ukhrul Formation is tectonically overlain by assemblage of igneous rocks. Considering the distribution of this part of rocks Bhattacharya & Bhattacharya (1984) have grouped this as 'Sirohi Formation'

These rocks consist predominantly of ultrabasics like serpentinite, altered peridotites and durites, etc. These ultrabasics are generally green to darkish green in colour, fine to coarse grained, highly fractured and traversed by criss-cross veins of actinolite asbestos. The thrust contact between this Formation and the underlying Ukhrul Formation is evidenced at the Sangsak-Chaugma and Chaugma-Cambin Sections. These rocks are well exposed around Sirohi and extend almost north-south for a considerable distance. Occasional presence of thinly bedded unfossiliferous metamorphosed, feldspathic sandstone and argillite are also met within this assemblage. However, the relationship between the volcanics and these metasediments is yet to be ascertained.

MINERAL RESOURCES

Manipur is endowed with some economically valuable minerals which are as follows :

i) **Asbestos** : Thin veins and veinlets of antigorite and chrysolite asbestos have been recorded in the massive serpentine bearing rocks near Moreh (24°19' N and 94°19' E), Nepali Basti (24°19' N and 94°15' E) and Kwatha (24°22' N and 94°18' E), but none of these occurrences seem to be of much economic importance.

ii) **Chromite** : Two chromite lenses have been located in the serpentinites a little north of the Sirohi peak (25°9'20" N and 94°28'E) in Ukhrul District, at an altitude of 1120 m. The lens to the

north is large with a strike length of 11 m. and a width of 8 m. exposed down to a depth 2.5 m. and filling a fracture within the serpentinite. The southern lens is 0.5 m. by 1.0 m. The chromite has a black metallic lustre giving a brown streak.

The result of chemical analysis of six chip samples is as follows (GSI, 1974) :

		%Cr ₂ O ₃	%Fe ₂ O ₃
1. Northern exposure	i.	55.38	14.70
	ii.	55.06	14.13
	iii.	56.34	14.02
	iv.	56.59	13.91
2. Southern exposure	i.	47.31	15.21
	ii.	47.68	15.10

The high Chromic oxide content and hard lumpy character reveal that it is of metallurgical grade which is in short supply in the country.

Another small pocket of chromite occurs near Nepali Basti. It covers about 90 sq km area and has a maximum thickness of about 0.3 m. Sporadic occurrences of chromite as pockets and lenses within peridotites and serpentine rocks have been recorded near the 49th 56th and 62nd mile-posts on the Tengnoupal-Moreh Road.

Three chromite lenses have been located in Therleicing Ridge, the first one being about 2 km. southeast of the Khudengthabri Village, the second one about 1 km south of the first one and the third one about 1 km further south. Mining of this material was carried out by the Orissa Industries Ltd. from 1976.

NW of Gamnom at Naruni Khayui peak (2230 m.) and east-west trending elongated pod of chromite occurs within serpentinised peridotite.

Ten elongated *en echelon* pods of chromite within serpentinite host rock was located in an area of 200m × 150m, about 800 m east of the crossing point of Gamnom-Pushing Road with Gamnom-Chasad Road. Three pockets of massive chromite within the ultrabasic rocks were recorded from northwest of Siruhifurur (Ghosh *et al.*, 1984). Chromite lenses within the ultrabasic country

rock were also noted near Phangrai (dimension 5 m × 5 m), Thangrai (dimension 2 m × 2m) and three lenses around Pashing Village (dimensions 5m × 10m 1 m × 2 m, and a minor body).

iii) **Copper** : Nickeliferous copper sulphides, chalcopyrite and chalcocite with cuprite and malachite were found at Nungan (24° 39' N and 94° 24' E) and Kongal Thana (24° 43' N and 94° 83' E) as small lenses and veins in basic and ultrabasic rocks. Samples from Nungan contain 1.23 to 3.3 per cent Copper with small quantities of Cobalt and Nickel. Several other minor occurrences of copper-ore were noticed near Ningthi (24° 52' N and 94° 26' E), Kwatha and Humine (24° 43' N and 94° 34' E). A few old pits in Sandangching Hill (24° 22' N and 94° 17' 30" E), about 5.6 km north of Kwatha Village show malachite, azurite and magnetite minerals along foliation and joint planes of the main serpentinite body. Maximum values in a batch of eight grab samples collected from pits are 10.56 per cent copper and 0.33 per cent Nickel. Specks of chalcopyrite with pyrite were found within dark grey shale exposed in a land slip near Kanglalingbi (24° 59' N and 95° 53' E) about 24 km. NNW of Imphal.

iv) **Lignite** : Investigation of the lignite occurrence near Kongvai Village (24°26'35" N and 93°42'32" E), Tureelo Valley, Manipur South District by detailed drilling was carried out by the GSI.

Overlying the Disang shale, the lignite was found in a narrow shallow basin. It was about 300 m long (N-S) and 200 m. wide (E-W) along the foot of a hill. It occurred as thin wide spaced lenses, associated with clay of various colours. It showed moderate dip (average 45°) towards west, striking almost N-S and is generally brown to brownish black in colour, soft and can be easily powdered. An E-W running fault along Tureelo Nala caused discontinuation of the lignite seam towards its northern bank.

A study of borehole data revealed that in general, the thickness of lenses down to a depth of 25 m (inclined depth) ranged from 0.1 to

0.5 m. Beyond this depth, the thickness in most cases do not exceed 0.1 m. Proved reserve of the lignite is of the order of 12,262 tons, while that of the associated clay stand at 2.52 million tons. The clay showed high plasticity when mixed with water.

v) **Clay** : Associated with lignite a 2 m thick bluish grey plastic clay occurred in an area, 2 km. west of Kongvai Village in Tureelo Valley (Bhattacharyya, 1973). Clay occurs as terrace deposits around Pallel along Mahaturel and Sekmeiturel rivers. It was derived from weathering of shales.

vi) **Coal** : The reported occurrence of coal in Jiribam Subdivision of Manipur, South District were actually carbonized wood found in rocks of the Surma and Tipam Groups. A 8 cm thick coal layer in sandstone was found towards SW of Kongai. The coal was friable in nature and dull in lustre, giving a sulphurous smell on burning.

vii) **Nickel** : Nickel, associated with serpentinite body, was reported from Nampesh (24° 43' N and 94° 34' E) and Kwatha (24° 20' N and 94° 17' E) areas lying on the eastern fringe of the State. This area was originally prospected by shallow pits for copper before the First World War but was later abandoned as the output was not encouraging. Geological mapping by the GSI in the Kwatha area, followed by analysis of the soil by geochemical method at Kwatha-Nampesh, Humine (24° 43' N and 94° 34' E) areas revealed that metallic nickel was dispersed in the soil as high concentrations mostly of the order of 4000 ppm. Quantitative estimation by conventional chemical analysis showed that the percentage of nickel varied up to 0.9 indicating the probability of concentration in the soil to merit further detailed exploration for assessment of the metal content (Alwar & Banerjee, 1963).

Soil samples in Moreh (24°15' N and 94°19' E) area contained 4000 ppm. of nickel and the surface weathered serpentine rock contained 0.24 to 0.90 per cent nickel in a combined state. The chemical analysis of 9 soil samples collected from a pit over the Sirohi hill, in Ukhrul District

showed encouraging results in respect of nickel. There was increase of nickel from 0.15 per cent at ground surface to 0.86 per cent between 240 and 270 cm depth.

viii) **Limestone** : The limestone occurs as lenses in a sequence of gritty sandstone and buff-coloured shale. It is grey in colour, highly jointed and fossiliferous containing grains of pyrite and veins of calcite. The limestone bearing bed has been included in 'Axial Group' which was considered to be older than Eocene in age by Oldham (1883).

Ukhrul area : The limestone deposit occurs about 400 m. east of Ukhrul town (25°06' N and 94°22' E) near Ukhrul-Sirohi Road. There are two limestone bands separated by a 15 m thick interbed of shale. The lower band is 90 m by 120 m and is totally unexposed in the surface. Its configuration is extrapolated only from the drilling data. The upper band extends for 260 m along the strike and 165 m in the dip direction. In a broad outline, the limestone deposit is a lensoid body with a maximum thickness of 80 m in the central part. The limestone is fine-grained showing varying shades of grey and brown, generally massive, and highly jointed at places.

The average grades of the limestone in the two bands are as follows :

	CaO	Insoluble	R2 O2	MgO
Band I (Upper)	43.18%	15.50%	4.55%	below 1%
Band II (Lower)	44.70%	15.55%	4.00%	below 1%

The total proved reserve at Ukhrul is of the order of 5.79 million tons down to a maximum depth of 105 m.

Other Limestone areas adjacent to Ukhrul : Hundung Area (25°03'N and 94°23'30" E) about 4 km to the south of lower Hundung Village, small lenses of limestones are exposed over a strike length of about 1.3 km. The longest of the three (Hundung North deposit) is exposed just by the side of old Ukhrul-Imphal Road. The second

lens (Hundung South deposit) occurs a little to the south of it. The limestone deposit reported at Mova occurs just in the Nungsang Kheng nala. The deposits at Hundung South and Mova are exposed fully in pyramidal or conical bodies. The base areas of the two deposits are 4000 sq m for Hundung South and 1750 sq m for Mova. The Hundung North deposit consists of two bands separated by a 25 m thick parting of shale. The lower band is 30 m in average thickness and extends for about 60 m. The band is reddish brown in colour and pinches out gradually towards down dip. The upper band is 40 m thick extending for about 130 m along the strike. It pinches out within 80 m along down dip. It is also massive, brownish red in colour.

Khanggoi (Kankhui) area (25°30'N and 94°24'E)—the deposit is located at a distance of 18 km. south-east of Ukhrul, approachable via Choither Village. The limestone is massive, highly jointed and almost fully exposed in a cone-shaped body occupying a base area of 2500 sq km up to the road level.

Lambui area : The deposit is located about 28 km. south-west of Ukhrul and is approachable by the old Ukhrul-Imphal Road *via* Lambui (25°00' N and 94°16' E). The deposit, exposed in an old quarry face is in the form of a small lensoid body, the probable extension of the deposit being approximately 50 m.

The probable reserves (in million tons) are :

Khanggoi (Kankhui)	—	0.26
Mova	—	0.045
Hundung South	—	0.17
Hundung North	—	1.77
Total	—	2.245

Considering 20 per cent mining loss, the available reserves will be of the order of 1.80 million tons. The above deposits including Ukhrul is in a position to sustain a Cement Plant of 300 tons per day for about 45 years. The poorer grade material from Ukhrul and Hundung North consisting of 42 per cent to 43 per cent of CaO and higher insoluble require to be blended with

the high grade limestone from Hundung South, Mova and Khanggoi for improving the grade. The R2 O3 in all these deposits is low, mostly in the range of 3 per cent to 5 per cent in which alumina-iron ratio varies between 1 : 2 to 2 : 3.

Other Minor Deposits : Limestone deposits near Kasam (24°58' N and 94°15' E) in the Ukhrul Sub-division and New Mongbung in the Churachandpur Sub-division have deposits.

There are three small deposits along the nala flowing roughly NW–SE on the eastern side of the old Ukhrul Road between Kasam and Sokapo villages. The first one is exposed in a small quarry (roughly 25 m in diameter) along the nala about 1 km. East of Kasam. The limestone resembles Lambui deposit. The second deposit is exposed in a small cliff section along the nala about 1 km. downstream of the first one for strike length of 75 m and the thickness being 12–14 m. The probable reserves for a depth of 15 m. are of the order of 27,000 tons. The third deposit is exposed about 0.8 km further downstream for a strike length of 50 m and the thickness is 10.1 m. The probable reserves of limestone for a depth of 15 m are of the order of 18,000 tons. Limestone exposures are seen in a small quarry at the foot of the hills on the western bank of Tuinong stream, where it takes a south-easterly course. The local people use limestone for lime making.

The Disang shale between Pallel (24°28' N and 94°02' E) and Chapikarong (24°13' N and 94°54' E) contain a few particular bands of limestone. They are (1) between 32/4 and 32/6 milestones on the Imphal–Moreh Road, east of Pallel, (2) east Tanporpi (24°15' N and 93°55' E), (3) near Charangling Khuron (24°21' N and 93°57' E), (4) near Beru Khunon (24°18' N and 93°57' E) and (5) at Chapikarong. The thickness of the band is 5 m. at Chapikarong, 30 m. near Topokpi and 106 m on Imphal–Moreh Road. The limestones are grey to cream coloured, massive and compact and at places carry veins of white calcite.

ix) **Salt** : A number of salt springs occur at Waikhung (24°25' N and 93°56' E), Kikhong (24°39' N and 94°06' E), Chandrakhong (24° 42' N and 94°08' E) and Keithalmanbai (24°44' N and 94°08' E) along the foothills in the eastern part of the Imphal Valley. These springs located along a probable fault zone. Local people tap most of the springs by driving 1 m diameter lined wells for manufacture of salt in small scale.

PREVIOUS WORKS

Geological activities in Manipur and adjacent regions were of the nature of scanty traverses during the pre-independent period of India. The earliest geological information of Manipur was given by Theobald (1873). Oldham (1883) was one of the early workers to give a broad geological account of Manipur. He correlated the limestone bearing bed around Ukhrul as “Axials of Arakan Yoma”, the southern tectonic equivalent of the Manipur Hill ranges. Clegg (1938) further found similar limestone from the adjoining Burman (=Myanmarese) part of the Indo-Burmese range and suggested a Cretaceous age to these exposures.

Pascoe (1912) studied the rocks exposed in east and west of Imphal valley and considered that ‘Axials’ of Oldham were in fact much similar to Mallet’s description (1876) of the ‘Disang Series’ of Upper Assam. He also pointed out that bulk of the Disang had more in common with the Negaris beds in Burma (Myanmar).

Raina (1959) differed with Oldham and considered only the ‘Cretaceous bed’ and not the ‘Disang Series’ as Axials. However, he also supported earlier workers in classifying the ultrabasic intrusives.

Evans (1932) and Mathur & Evans (1964) referred the sequence of dark grey shales with thin bands of sandstones to ‘Disang Series’ and noted that near Ukhrul the Disang shales are closely associated with Cretaceous limestone but the field relationship was not fully established.

Pascoe (1950) mentioned that the contact of Disang and Makware beds of Myanmar (more

like Disang but shows greater degree of metamorphism, foliated habit and harder texture) are characterised by serpentinite intrusions which are probably of Upper Cretaceous age.

Geologists of the G S I had carried out mineral investigation and systematic geological mapping from time to time in different parts of Manipur State. Preliminary studies for copper and nickel were carried out by Chakraborty & Raina (1958). Dutt (1959) carried out preliminary investigation for nickel at Kwatha, Nampesha, Huimine areas and indicated nickel concentration in the soil resting over ultramafic rocks. Alwar, Banerjee & Dayal (1960-61) carried out investigation for nickel and copper mineralisation in Moreh area.

Biswas (1962) recorded *Globigerina*, *Globotruncana* and *Pseudotextularia* to be the dominant Foraminifera in the basinal marl facies developed near Taupokpi and suggested that these may correspond to the Langpar Formation of Meghalaya.

Dayal & Duara (1962-63) carried out geological mapping and mineral investigation in Ukhrul subdivision and they classified the sedimentaries, with limestone pockets, as Axials. They opined that the Chimi conglomerate of Pascoe resembles Ukhrul conglomerate.

Brunnseweiler (1966, 1974), who mapped the contiguous Arakan Yoma-Nagal Hills and Chin Hill tracts of the Burmese (Myanmarese) part of the Indo-Burma range differed considerably with all the existing views. According to him these limestones were exotic floaters within an otherwise 'Exotic' flysch Formation. He even identified limestone exotic blocks indicating Cretaceous and Eocene ages. Other such rootless blocks identified by him consist of greywacke, calcareous sandstone, chert, serpentinite, conglomerate etc. He did not agree in grouping these exotic blocks as well as the 'Exotic flysch' within the so-called 'Axials' of Theobald (1872). He stated that the tectonosedimentary set up resulting in such occurrences of exotic blocks in the Indo-Burmese range was having legacy to the Pre-Oligocene evolution.

Nandy & Sriram (1970) classified the rocks into a Cretaceous Ukhrul bed and a Eocene Disang Formation, and had their disagreement in grouping the rocks under 'Axial' They noticed some Upper Cretaceous fossils in one of the limestone bands.

Sriram & Mukhopadhyay (1971) and Sriram *et al.* (1972) carried out mapping near Ukhrul and classified the rocks of eastern Manipur on lithological basis into three Formations as follows :

Sirohi Formation	Intrusive serpentinite bodies;
Ukhrul Formation	Shale, Siltstone, Sandstone grit, Conglomerate, Limestone, etc.
Litan Formation	Dark grey shale, Siltstone.

Ghosal (1972) carried out investigation on the economic potentiality of the limestone deposits in Ukhrul, Hundung, Mova and Kankhui areas and observed that the contact of Cretaceous beds overlying the Diasang shale was tectonic and allochthonous in nature.

GSI (1974) brought out an account of the geology and mineral resources of the State of Manipur on the basis of earlier works carried by the geologists in this area.

Chattopadhyay & Roy (1975) attempted to establish a stratigraphic sequence around Chingai in eastern Manipur. They classified the rocks into two groups viz., Lower argillaceous Chingai group and Upper arenaceous Kongai group. They noticed following invertebrate fossils from Chingai Group (Argillaceous strata):

Bivalvia : *Cardium* sp., *Chlamys* sp., *Lucinia* sp., *Ostrea* sp., *Trigonia* sp., *Pinna* sp., *Spondylus* sp., *Tellina* sp., and *Pecten* sp.

Gastropoda : *Turritella* sp.

Foraminifera : *Globotruncana* sp., *Globigerina* sp., *Nodosaria* sp.

They noticed a small pocket of limestone and calcareous strata containing planktonic

Foraminifera, *Globotruncana* in the lower part of Chingai Group, indicative of Upper Cretaceous age.

Satsangi & Chatterjee (1979) identified fossils of *Arca*, *Barbatia*, *Corbicula*, *Ostrea*, *Pinna* and *Tellina* (all Bivalves); *Turritella* (Gastropoda), and *Trochocyathus* (Cocclerata) in the Disang Group near Sundal in Ukhrul District.

Roy (1980) recognized a few radiolarian forms in a collection of arkosic sandstone and cherts from Gamnom area of Ukhrul District.

Sinha *et al.* (1982) presented a concise account of the palaeontological studies carried out on the various sedimentaries in Manipur, and in other States of the north-eastern India.

Bhattacharya & Bhattacharya (1984) made detail study of the stratigraphy and palaeontology of rocks of eastern parts of Manipur. They reconstructed the stratigraphic succession as follows: Sirohi Formation, Ukhrul Formation and Lamlang Formation. They recorded a number of Foraminifera, Corals, Ostracoda, Pelecypoda and Gastropoda from fossilized limestone blocks. They opined that the limestone of Manipur part of the Indo-Burma orogene are like those of the contiguous Chin hills, Arakan-Yoma and coastal Burma (Myanmar) where such exotic floaters have already been noted within (Palaeocene-Lower Eocene) rock association (Shale-Siltstone geosynclinal flysch facies).

Ghosh *et al.* (1984) recorded the presence of a rich radiolarian microfauna in parts of eastern Manipur.

GSI (1985) recorded foraminifer microfauna from lime stones in Chandel District, which were referred to Lower Eocene age.

Mitra *et al.* (1986) traced an olistostromal belt on the eastern part of Manipur, lying west of Naga Hills ophiolite belt. They revealed that the exotics were of varying age viz., Palaeocene, Lower Eocene, Middle Eocene and Upper Eocene. They recorded a number of microfauna and molluscan forms from these rock beds.

Bhattacharya & Bhattacharya (1987) reviewed the palaeontology of the Upper Cretaceous rocks of eastern part of Manipur, while dealing with the sediments of north-eastern India.

Saxena (1987) made observations on the lithostratigraphy of the Barail Group of rocks in Manipur and suggested for regrouping of the succession.

GSI (1987) identified a rich fossiliferous zone within the Disang Formation in a hill, east of Thoubal in NW-SE direction.

Mishra (1990) reported the result of palaeontological study of Disang-Barail sediments in parts of Ukhrul and Chandel Districts of Manipur. He (1991) reported the results of similar study in the Ukhrul, Churachandpur and Bishenpur Districts.

Chungkham Prithiraj *et al.* (1992) worked out the foraminifer assemblages from exotic blocks in the Melange zone of Ukhrul area providing data on deep oceanic sediments in Late Cretaceous and their subsequent abduction along the eastern margin of the Indian plate.

Mishra (1993) updated the palaeontological data on micro- and megabiota of the ophiolite belt and adjoining Disang and Barail Formations of Manipur.

Chungkham Prithiraj & Caron (1996) compared the foraminifer assemblages of Ukhrul Melange zone of Manipur with the wildflysch zone of Switzerland, two distant parts of the Tethys Sea.

Chungkham Prithiraj & Jafar (1998) worked out the preserved assemblage of Foraminifera and Coccoliths from the pelagic limestones of Melange zone of Manipur ophiolite belt of Ukhrul area. The biostratigraphy of five exotic limestone blocks encompassing a Late Santonian/Early Campanian to Late Maestrichtian time slice was also postulated.

SYSTEMATIC PALAEONTOLOGY

LIST OF TAXA

- Phylum PROTOZOA
 Subphylum SARCODINA
 Class RHIZOPODA
 Order FORAMINIFERA
 Family GLOBOTRUNCANIDAE
 Genus **Globotruncana** Cushman
1. *Globotruncana aegyptica* Nakkady
 2. *G. arca* (Cushman)
 3. *G. bulloides* Vogler
 4. *G. dupeblei* Caron, Gonzales Donoso, Robaszynski & Wonders
 5. *G. falsostuarti* Sigal
 6. *G. linneiana* d'Orbigny
 7. *G. mariei* Banner & Blow
 8. *G. orientalis* El Naggar
 9. *G. pseudoconica* Solakius
 10. *G. rosetta* (Carsey)
 11. *G. ventricosa* White
- Genus **Globotruncanita** Reiss
12. *Globotruncanita angulata* (Tilley)
 13. *G. calcarata* (Cushman)
 14. *G. conica* (White)
 15. *G. elevata* (Brotzen)
 16. *G. pettersi* (Gandolfi)
 17. *G. stuarti* (de Lapparent)
 18. *G. stuartiformis* (Dalbiez)
 19. *G. subspinosa* (Pessagno)
- Genus **Rosita** Caron, Gonzalez Donoso, Robaszynski & Wonders
20. *Rosita contusa* (Cushman)
 21. *R. fornicata* (Plummer)
 22. *R. patelliformis* (Gandolfi)
- Genus **Hedbergella** Brönnimann & Brown
23. *Hedbergella holmdelensis* Olsson
 24. *H. flandrini* Porthault
- Genus **Abathomphallus** Bolli, Loeblich & Tappan
25. *Abathomphallus intermedius* (Bolli)
 26. *A. mayaroensis* (Bolli)
- Genus **Archaeoglobigerina** Pessagno
27. *Archaeoglobigerina blowi* Pessagno
- Genus **Rugoglobigerina** Brönnimann
28. *Rugoglobigerina hexacamerata* Brönnimann
 29. *R. macrocephala* Brönnimann
- Genus **Gansserina** Caron, Gonzalez Donoso, Robaszynski & Wonders
30. *Gansserina gansseri* (Bolli)
 31. *G. wiedenmayeri* (Gandolfi)
- Genus **Globotruncanella** Reiss
32. *Globotruncanella havanensis* (Woorwijk)
 33. *G. petaloidea* (Gandolfi)
 34. *G. pschadae* (Keller)
- Genus **Dicarinella** Porthault
35. *Dicarinella asymetrica* Sigal
- Genus **Marginotruncana** Hofker
36. *Marginotruncana coronata* (Bolli)
 37. *M. marginata* (Reuss)
 38. *M. pseudolinneiana* Pessagno
 39. *M. sinuosa* Porthault
 40. *M. undulata* (Lehman)
- Family HETEROHELICIDAE
 Genus **Planoglobulina** Cushman
41. *Planoglobulina acervulinoides* (Egger)
- Genus **Pseudoguembelina** Brönnimann & Brown
42. *Pseudoguembelina excolata* (Cushman)
 43. *P. sp.*
- Genus **Pseudotextularia** Rzehak
44. *Pseudotextularia elegans* Rzehak
 45. *P. intermedia* De Klasz
 46. *P. nuttali* (Voorwizk)
- Genus **Racemiguembelina** Montanaro Gallitelli
47. *R. fructicosa* (Egger)

- Genus *Gublerina* Kikione
 48. *Gublerina* sp.
- Genus *Heterohelix* Ehrenberg
 49. *Heterohelix* sp.
- Family NUMMULITIDAE
 Genus *Nummulites* Lamarck
 50. *Nummulites* sp.
- Family DISCOCYCLINIDAE
 Genus *Discocyclina* Gümbel
 51. *Discocyclina* sp.
- Family BOLIVINITIDAE
 Genus *Bolivina* d'Orbigny
 52. *Bolivina* sp.
- Family TEXTULARIIDAE
 Genus *Vulvulina* d'Orbigny
 53. *Vulvulina* sp.
- Genus *Textularia* Defrance
 54. *Textularia* sp.
- Family GLOBOROTALIIDAE
 Genus *Globorotalia* Cushman
 55. *Globorotalia* sp.
- Family BULIMINIDAE
 Genus *Bulimina* d'Orbigny
 56. *Bulimina* sp.
- Family NONIONIDAE
 Genus *Nonion* de Montfort
 57. *Nonion* sp.
- Family NODOSARIIDAE
 Genus *Dentalina* Risso
 58. *Dentalina* sp.
- Genus *Lagena* Walker & Jacob
 59. *Lagena* sp.
- Family CIBICIDIDAE
 Genus *Cibicides* de Montfort
 60. *Cibicides* sp.
- Family HANTKENINIDAE
 Genus *Globanomalina* Haque
 61. *Globanomalina* sp.

- Genus *Hastigerina* Thomson
 62. *Hastigerina* sp.
- Family PLEUROSOMELLIDAE
 Genus *Nodosarella* Rzehak
 63. *Nodosarella* sp.
- Family MILIOLIDAE
 Genus *Quinqueloculina* d'Orbigny
 64. *Quinqueloculina* sp.
- Family ALVEOLINIDAE
 Genus *Borelis* de Montfort
 65. *Borelis* sp.
- Family ROTALIIDAE
 Genus *Rotalia* Lamarck
 66. *Rotalia trochidiformis* Lamarck
- Family ASTORRHIZIDAE
 Genus *Bathysiphon* M. Sars
 67. *Bathysiphon* sp.
- Family LITUOLIDAE
 Genus *Haplophragmoides* Cushman
 68. *Haplophragmoides* sp.
- Class ACTINOPODA
 Subclass RADIOLARIA
 Order PORULOSIDA
 Suborder SPUMELLINA
 Family LIOSPHAERIDAE
 Genus *Caenosphaera* Ehrenberg
 69. *Caenosphaera* sp.
- Family ELLIPSIDIIDAE
 Genus *Ellipsidium* Haeckel
 70. *Ellipsidium* sp.
- Genus *Lithapium* Haeckel
 71. *Lithapium* sp.
- Family DRUPPULIDAE
 Genus *Druppula* Haeckel
 72. *Druppula* sp.
- Family SPONGURIDAE
 Genus *Spongoprimum* Haeckel
 73. *Spongoprimum* sp.

- Genus *Spongurus* Haeckel
 74. *Spongurus* sp.
 Family CYPHANTIDAE
 Genus *Ommatospyris* Ehrenberg
 75. *Ommatospyris* sp.
 Family CENODISCIDAE
 Genus *Cendodiscus* Haeckel
 76. *Cenodiscus* sp.
 Family PHACODISCIDAE
 Genus *Sethodiscus* Haeckel
 77. *Sethodiscus* sp.
 Genus *Periphaena* Ehrenberg
 78. *Periphaena* sp.
 Genus *Triactis* Haeckel
 79. *Triactis* sp.
 Family SPONGODISCIDAE
 Genus *Spongodiscus* Ehrenberg
 80. *Spongodiscus* sp.
 Genus *Spongophacus* Haeckel
 81. *Spongophacus* sp.
 Genus *Dictyocoryne* Ehrenberg
 82. *Dictyocoryne* sp.
 Order OCULOSIDA
 Suborder NASSELLINA
 Family ARCHIOCORYTHIDAE
 Genus *Archiochorys* Haeckel
 83. *Archiochorys* sp.
 Genus *Cornutana* Haeckel
 84. *Cornutana* sp.
 Genus *Cyrtocalpis* Haeckel
 85. *Cyrtocalpis* sp.
 Genus *Archicapsa* Haeckel
 86. *Archicapsa* sp.
 Family LOPHOPHAENIDAE
 Genus *Sethocyrtis* Haeckel
 87. *Sethocyrtis* sp.
 Genus *Lithocampana* Clarke & Campbell
 88. *Lithocampana* sp.

- Genus *Adelocyrtis* Pantanelli
 89. *Adelocyrtis* sp.
 Genus *Cryptocapsa* Haeckel
 90. *Cryptocapsa* sp.
 Genus *Dicanthocapsa* Haeckel
 91. *Dicanthocapsa* sp.
 Family THEOCORYTHIDAE
 Genus *Theocyrtis* Haeckel
 92. *Theocyrtis* sp.
 Genus *Theocapsa* Haeckel
 93. *Theocapsa* sp.
 Genus *Tricolocapsa* Haeckel
 94. *Tricolocapsa* sp.
 Family ARTOPHORMIDIDAE
 Genus *Kassina* Chabakov
 95. *Kassina* sp.
 Family STICHOCORYTHIDAE
 Genus *Diplostrobos* Squinabol
 96. *Diplostrobos* sp.
 Genus *Lithocampe* Ehrenberg
 97. *Lithocampe* sp.
 Genus *Lithomitra* Bütschli
 98. *Lithomitra* sp.
 Genus *Stichocapsa* Haeckel
 99. *Stichocapsa* sp.
 Family GLYCOBOTRYDIDAE
 Genus *Glycobotrys* Campbell
 100. *Glycobotrys* sp.
 Family POLYBOTRYDIDAE
 Genus *Polybotrys* Haeckel
 101. *Polybotrys* sp.
 Genus *Botryocampe* Haeckel
 102. *Botryocampe* sp.
 Phylum COELENTERATA
 Subphylum ANTHOZOA
 Class ZOANTHARIA
 Order SCLERACTINA

Family MUSSIDAE
Genus *Circophyllia* Milne-Edwards & Haime

103. *Circophyllia* sp.

Family CARYOPHYLLIDAE
Genus *Oxysmilia* Duchassaing

104. *Oxysmilia* sp.

Genus *Trochocyathus* Milne-Edwards
& Haime

105. *Trochocyathus* sp.

Genus *Tethocyathus* Kühn

106. *Tethocyathus* sp.

Phylum BRYOZOA
Subphylum ENTOPROCTA
Class GYMNOLAEMATA
Order CHEILOSTOMATA
Family HINCKSINIDAE
Genus *Hincksinia* Norman

107. *Hincksinia* sp.

Genus *Aplousina* Canu & Bassler

108. *Aplousina* sp.

Family CALLOPORIDAE
Genus *Alderina* Norman

109. *Alderina* sp.

Phylum ARTHROPODA
Class CRUSTACEA
Order PODOCAPIDA
Family BAIRDIIDAE
Genus *Bairdia* McCoy

110. *Bairdia* sp.

Family LEGUMINOCYTHERIDAE
Genus *Leguminocythereis* Howe

111. *Leguminocythereis* sp.

Genus *Acuticythereis* Edwards

112. *Acuticythereis* sp.

Order DECAPODA
Suborder PLEOCYEMATA
Infraorder BRACHYURA
Superfamily PORTUNOIDEA

Family PORTUNIDAE

Genus *Portunus* Weber

113. *Portunus* sp.

Superfamily XANTHOIDEA

Family GONEPLACIDAE

Genus *Galenopsis* Milne-Edwards

114. *Galenopsis* sp.

Phylum MOLLUSCA

Class BIVALVIA (PELECYPODA)

Subclass PALAEOTAXODONTA

Order NUCULOIDA

Family NUCULIDAE

Genus *Nucula* Lamarck

115. *Nucula* sp.

Family NUCULANIDAE

Genus *Nuculana* Link

116. *Nuculana* sp.

Subclass PTERIOMORPHA

Order ARCOIDA

Family ARCIDAE

Genus *Barbatia* Gray

117. *Barbatia* sp.

Family GLYCYMERIDIDAE

Genus *Glycymeris* da Costa

118. *Glycymeris* sp.

Order MYTILOIDA

Family MYTILIDAE

Genus *Brachiodontes* Swainson

119. *Brachiodontes* sp.

Genus *Mytilus* Linnaeus

120. *Mytilus* sp.

Family PINNIDAE

Genus *Pinna* Linnaeus

121. *Pinna* sp.

Order PTERIOIDA

Family PECTINIDAE

Genus *Euberneopecten* Conrad

122. *Euberneopecten* sp.

Genus *Chlamys* Roeding

123. *Chlamys* (*Chlamys*) sp.

124. *Chlamys* (*Aequipecten*) sp.

Genus *Pecten* Müller

125. *Pecten* (*Pecten*) sp.

Family SPONDYLIDAE

Genus *Spondylus* Linnaeus

126. *Spondylus* (*Spondylus*) sp.

Subclass PALAEOHETERODONTA

Order UNIONOIDA

Family UNIONIDAE

Genus *Potomida* Swainson

127. *Potomida* sp.

Order TRIGONIOIDA

Family TRIGONIIDAE

Genus *Trigonia* Bruguiere

128. *Trigonia* sp.

Subclass HETERODONTA

Order VENEROIDA

Family LUCINIDAE

Genus *Lucinia* Bruguiere

129. *Lucinia* sp.

Family UNGULINIDAE

Genus *Diplodonta* Bronn

130. *Diplodonta* sp.

Family CARDITIDAE

Genus *Cardiocardita* Anton

131. *Cardiocardita* sp.

Genus *Venericardia* Lamarck

132. *Venericardia* sp.

Family CARDIIDAE

Genus *Cardium* Linnaeus

133. *Cardium* sp.

Genus *Loxocardium* Cossmann

134. *Loxocardium* sp.

Genus *Vepricardium* Iredale

135. *Vepricardium* sp.

Genus *Trachycardium* Moersch

136. *Trachycardium* sp.

Family TELLINIDAE

Genus *Tellina* Linnaeus

137. *Tellina* sp.

Family PSAMMOBIIDAE

Genus *Gari* Schummacher

138. *Gari* (*Garum*) sp.

Family ARCTICIDAE

Genus *Arctica* Schummacher

139. *Arctica* sp.

Family KELLIELLIDAE

Genus *Allopagus* Stoliczka

140. *Allopagus* sp.

Family GLOSSIDAE

Genus *Glossus* Poli

141. *Glossus* (*Cytherocardia*) sp.

Family CORBICULIDAE

Genus *Corbicula* Mergele von Mühlfeld

142. *Corbicula* sp.

Family VENERIDAE

Genus *Pitar* Römer

143. *Pitar* sp.

Genus *Mercenaria* Schummacher

144. *Mercenaria* sp.

Order MYOIDA

Family CORBULIDAE

Genus *Corbula* Bruguiere

145. *Corbula* sp.

Genus *Caestocorbula* Vincent

146. *Caestocorbula* (*Parmicorbula*) sp.

Family PHOLADIDAE

Genus *Scobinopholas* Grant & Gayle

147. *Scobinopholas* sp.

Family HIATELLIDAE

Genus *Panopea* Menard

148. *Panopea* sp.

- Order HIPPURITOIDA
 Family MONOPLEURIDAE
 Genus *Paramonopleura* Korabkov
 149. *Paramonopleura* sp.
- Subclass ANOMALODESMATA
 Order PHOLADOMYOIDA
 Family CUSPIDARIIDAE
 Genus *Cuspidaria* Nardo
 150. *Cuspidaria* sp.
- Order MYTILOIDA
 Suborder OSTREINA
 Family OSTREIDAE
 Genus *Ostrea* Linnaeus
 151. *Ostrea* sp.
- Class GASTROPODA
 Subclass PROSOBRANCHIA
 Order ARCHAEOGASTROPODA
 Family TROCHIDAE
 Genus *Margarites* Gray
 152. *Margarites* sp.
- Genus *Solariella* Wood
 153. *Solariella* sp.
- Family TURBINIDAE
 Genus *Collonia* Gray
 154. *Collonia* sp.
- Suborder NERITOPSINA
 Family NERITIDAE
 Genus *Nerita* Linnaeus
 155. *Nerita* sp.
- Family PATELLIDAE
 Genus *Helcion* Montfort
 156. *Helcion* sp.
- Order MESOGASTROPODA
 Family LITTORINIDAE
 Genus *Littorina* Ferussac
 157. *Littorina* sp.

- Family EPITONIDAE
 Genus *Cirsotrema* Moersch
 158. *Cirsotrema* sp.
- Family TURRITELLIDAE
 Genus *Turritella* Lamarck
 159. *Turritella* sp.
- Family CERITHIIDAE
 Genus *Cerithium* Bruguiere
 160. *Cerithium* sp.
- Family NATICIDAE
 Genus *Natica* Scopoli
 161. *Natica* sp.
- Family FICIDAE
 Genus *Ficus* Roeding
 162. *Ficus* sp.
- Order NEOGASTROPODA
 Superfamily MURICOIDAE
 Family BUCCINIDAE
 Genus *Neptunea* Roeding
 163. *Neptunea* sp.
- Family FASCIOLARIIDAE
 Genus *Mazzalina* Conrad
 164. *Mazzalina* sp.
- Subclass HETEROBRANCHIA
 Superorder ALLOGASTROPODA
 Family ARCHITECTONICIDAE
 Genus *Architectonica* Roeding
 165. *Architectonica* sp.
- Order OPHISTOBRANCHIA
 Suborder NUDIBRANCHIA
 Family DORIDIDAE
 Genus *Cadlina* Bengli
 166. *Cadlina* sp.
- Class CEPHALOPODA
 Superfamily BOLITAENOIDEA
 Family BOLITAENIDAE
 Genus *Japetella* Hoyle
 167. *Japetella* sp.

SYSTEMATIC ACCOUNT

Phylum PROTOZOA

Subphylum SARCODINA

Class RHIZOPODA

Order FORAMINIFERA

Family GLOBOTRUNCANIDAE

Genus *Globotruncana* Cushman

1927. *Globotruncana* Cushman, An outline of reclassification of the foraminifers. *Contr. Cush. Lab. Foram. Res.*, 3 pt. 1, p. 39

1. *Globotruncana aegyptica* Nakkady

1950. *Globotruncana aegyptica* Nakkady, *Journ. Pal.* **24** (6) : 690.

Diagnosis : Umbilical side: Primary aperture umbilical; sutures radial, straight to slightly curved, depressed; 3–5 chambers, subtrapezoidal, with a convex pustulose surface becoming smooth towards the end of the whorl. Spiral side : Outline lobate; chambers globular initially, then petaloid and finally elongated; chambers increasing rapidly in size as added. Lateral view : Profile asymmetrical, two keels on all chambers, equally developed, parallel. Size : 3–5 mm.

Locality : Manipur, Ukhrul District, Mova limestone.

Geological horizon : Late Cretaceous (Maastrichtian).

2. *Globotruncana arca* (Cushman)

1926. *Pulvinulina arca* Cushman, *Contr. Cush. Lab. Foram. Res.* **2**, pt. No. **26** : 23.
1984. *Globotruncana arca* : Robaszynski, Caron, Donoso & Wonders, *Rev. de Micropaleontol.* **26** (3-4) : 182.

Diagnosis : Umbilical side: Primary aperture umbilical; sutures generally curved and always lined by a raised and beaded sutural ridge ; normally 6-7 chambers, elongated, somewhat rectangular, generally with a flat to concave, smooth to pustulose surface; adumbilical ridges developed on all chambers. Spiral side: Outline lobate to subcircular; chambers of variable shape,

chambers increasing slowly to moderately in size as added. Lateral view: Trochospire moderately high; two keels on all chambers. Size : 0.5-0.6 mm.

Locality : Manipur, Ukhrul District, Hundung North and Mova limestone.

Geological horizon : Late Cretaceous (Maastrichtian).

3. *Globotruncana bulloides* Vogler

1941. *Globotruncana linnei bulloides* Vogler, *Palaeontographica*, Suppl., **4** : 287.
1984. *Globotruncana bulloides* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.* **26** (3-4) : 186.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures curved to straight, depressed, 6-7 chambers, trapezoidal, with an inflated and slightly pustulose surface; adumbilical ridges developed on all chambers, tangential. Spiral side : Outline lobate; sutures curved, raised and beaded; chambers petaloid, semicircular to crescent-shaped with an inflated surface; chambers increasing slowly in size as added. Lateral view : Trochospire low ; profile symmetrical with chambers typically convex on either side; two keels on all chambers, equally developed and parallel. Size : 0.4-0.5 mm.

Locality : Manipur, Ukhrul District, Hundung North and Mova limestone.

Geological horizon : Late Cretaceous (Maastrichtian).

4. *Globotruncana dupeublei* Caron, Gonzales Donoso, Robaszynski & Wonders

1984. *Globotruncana dupeubli* Caron, Gonzalez Donoso, Robaszynski & Wonders, *Rev. de Micropaleontol.* **26** (3-4) : 188.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures straight to curved, often depressed; 7-9 chambers, trapezoidal to rectangular, smooth surface; adumbilical ridges developed on all chambers, oblique. Spiral side : Outline lobate; sutures curved to straight;

chambers increasing slowly in size as added. Lateral view : Trochospire of variable height; one peripheral keel. Size : 0.8-0.9 mm.

Locality : Manipur, Ukhrul District, Kangkhui, Hundung and Lambin.

Geological horizon : Late Cretaceous (Maastrichtian).

5. *Globotruncana falsostuarti* Sigal

1952. *Globotruncana falsostuarti* Sigal, Congr. Géol. int. XIX, Alger, Monogr. rég., sér. I, Algeria, No. 26, p.43.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures curved but straight between final chambers; 7-8 chambers, trapezoidal, with a flat to slightly concave, smooth surface; adumbilical ridges developed on all chambers, tangential to oblique; umbilical system composed of large tegilla. Spiral side : Outline lobate; sutures straight or slightly curved; chambers petaloid; chambers increasing slowly in size as added. Lateral view : Trochospire of variable height; two keels, but umbilical keel less developed and often absent towards the end of the last whorl. Size : 0.6-0.7 mm.

Locality : Manipur, Ukhrul District, Hundung North and Mova lime stones.

Geological horizon : Late Cretaceous (Maastrichtian).

6. *Globotruncana linneiana* (d' Orbigny)

1839. *Rosalina linneiana* d' Orbigny, in Ramon de la Sagra, *Histoire physique et naturelle de l' Ile de Cuba*. A. Bertrand, Paris, p. 105.

1984. *Globotruncana linneiana* : Robaszynski, Caron, Donso & Wonders, *Rev. de Micropaleontol.* 26 (3-4) : 200.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures curved, depressed, but often lined by a slightly raised and beaded sutural ridge; 5-7, rarely 4½-8 chambers, subtrapezoidal, slightly convex, but weakly concave towards end of the whorl; adumbilical ridges developed on all

chambers, tangential or oblique; peripheral keel, sutural ridge and adumbilical ridge forming a horse-shoe shaped pattern. Umbilicus : 1/3 to ½ of maximum diameter; umbilical system composed of large tegilla. Spiral side : Outline lobate, sutures generally curved; chambers petaloid to crescent-shaped, with a smooth and flat surface; chambers increasing variably, but generally slowly, in size as added. Lateral view : Trochospire very low; profile slightly asymmetrical; two keels on all chambers equally developed and parallel, separated by a rather wide imperforate peripheral band. Size : 0.3-0.6 mm.

Locality : Manipur, Ukhrul District, Hundung North and Mova limestones.

Geological horizon : Late Cretaceous (Maastrichtian).

7. *Globotruncana mariei* Banner & Blow

1960. *Globotruncana mariei* Banner & Blow, *Cush. Found. Foram Res. Contr.*, Ithaca, 11 : 8.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures curved and often depressed; 4 ½ to 5 ½ chambers, kidney-shaped with convex surface; adumbilical ridges generally well developed on all chambers, oblique to tangential; Umbilicus about one-third of maximum diameter; umbilical system composed of tegilla. Spiral side : Outline moderately lobate, more lobate towards end of the last whorl; sutures curved, but often straight between the last chambers, raised and beaded; chambers crescent-shaped, the last one or two petaloid or semicircular; chambers increasing fairly rapidly in size as added in the last whorl. Lateral view : Trochospire low; profile nearly symmetrical with the umbilical side sometimes more convex; two keels on all chambers. Size : 0.3 to 0.6 mm.

Locality : Manipur, Ukhrul District, Hundung North and Mova limestones.

Geological horizon : Late Cretaceous (Maastrichtian)

8. *Globotruncana orientalis* El Naggar

1966. *Globotruncana orientalis* El Naggar, *Brit. Mus. (Nat. Hist.) Bull., Geol. Suppl.*, No. 2 : 125.

Diagnosis : Primary aperture umbilical; sutures curved, variably depressed; 5–7 chambers, sometimes 8, rectangular to trapezoidal, with a variably convex and smooth surface; adumbilical ridges generally most developed in the first chambers, tangential to oblique; adumbilical ridge, sutural ridge and peripheral keel in continuity on the first chambers, forming a horse-shoe shaped pattern; umbilical system composed of large tegilla. Spiral side : Outline slightly lobate to subcircular; sutures slightly curved to almost straight, raised and beaded; chambers crescent-shaped to petaloid, with a smooth and flat surface; chambers increasing slowly to moderately in size as added. Lateral view : Trochospire moderately high; profile symmetrical to slightly asymmetrical; two keels but umbilical keel often less developed; keels parallel, separated by a narrow imperforate peripheral band. Size : 0.5 to 0.9 mm.

Locality : Manipur, Ukhrul District, Hundung North limestones.

Geological horizon : Late Cretaceous (Maastrichtian).

9. *Globotruncana pseudoconica* Solakius

1982. *Globotruncana pseudoconica* Solakius, *Geobios*, 15 (6) : 873–889.

Diagnosis : Profile almost plano-convex, with a strongly convex spiral side and an almost flat umbilical side, giving the appearance of a cone. It has two keels which are somewhat *falsostuarti*-like on the early chambers of the last whorl and a single keels on the later chambers. *G. pseudoconica* differs from other *Globotruncana* in having a test with a very high trochospire and with a subcircular outline.

Locality : Manipur, Ukhrul District, Hundung North and South, Mova and Kangkhui in Ukhrul Melange Zone.

Geological horizon : Late Cretaceous (Maastrichtian).

10. *Globotruncana rosetta* (Carsey)

1926. *Globigerina rosetta* Carsey, *Texas Univ. Bull.*, Austin, No. 2612 : 44.
1984. *Globotruncana rosetta* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.* 26 (3-4) : 210.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures curved to straight, generally lined by a raised sutural ridge between the first chambers; 4 to 5½ chambers, mostly 5, trapezoidal to kidney-shaped, with a flat to convex and smooth surface; adumbilical ridges developed on all chambers, tangential to slightly oblique; umbilicus one-third to little more than one-third of maximum diameter; umbilical system composed of large tegilla. Spiral side : Outline moderately lobate, more lobate at the end of the last whorl; sutures curved, sometimes almost straight towards the end of the last whorl, with a flat smooth surface; chambers increasing rapidly in size as added. Lateral view : Trochospire generally low; profile asymmetrical; two keels, parallel, separated by a narrow imperforate peripheral band. Size : 0.4 to 0.6 mm.

Locality : Manipur, Ukhrul District, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

11. *Globotruncana ventricosa* White

1928. *Globotruncana canaliculata* var. *ventricosa* White, *J. Paleontol.* 2 : 284.
1946. *Globotruncana ventricosa* : Cushman, *U.S. Geol. Surv. Prof. Pap.* 206 : 150.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures slightly curved to straight, depressed, but sometimes lined by pustules; 6 – 7, rarely 5, 5½ or 8 chambers, trapezoidal, with a flat to convex surface, pustulose but becoming smooth towards end of the whorl; adumbilical ridges developed on all chambers except occasionally on the last one or two oblique, sutural ridges often enveloped by succeeding chambers; umbilicus about half of the maximum

diameter; umbilical system composed of large tegilla. Spiral side : Outline lobate, sutures curved, raised and beaded, joining spiral suture often at acute angle; chambers crescent-shaped, semicircular towards end of the last whorl, with a smooth and generally flat surface; chambers increasing slowly in size as added towards end of the last whorl. Lateral view : Trochospire very low; profile typically asymmetrical, spiral side flat and umbilical side convex, chambers triangular in outline; two keels on all chambers, equally developed and parallel, separated by an imperforate peripheral band of variable width. Size : 0.4–0.7 mm.

Locality : Manipur, Ukhrul District, Hundung North and South, Kangkhui and Mova limestones.

Geological horizon : Late Cretaceous (Maastrichtian).

Genus *Globotruncanita* Reiss

1957. *Globotruncanita* Reiss, *Contr. Cush. Found. Foram. Res.* 8 : 127–145.

12. *Globotruncanita angulata* (Tilev)

1951. *Globotruncana lugeoni* var. *angulata* Tilev, *Mud. Tet. Arama Inst. Turkey, B.*, No. 1b : 46.
- 1984 *Globotruncanita angulata* : Robaszyaski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.* 26 (3-4) : 220.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures curved and depressed; 5–6 chambers, triangular, with a convex and at least in the first chambers pustulose surface; adumbilical ridges more or less developed on all chambers, tangential to slightly oblique; umbilicus one-third to half of the maximum diameter; umbilical system composed of flattened portici, merging inside the umbilicus by their distal edges. Spiral side : Outline subcircular to slightly lobate; sutures straight, raised and beaded, joining spiral suture at acute angle but almost right angle in end of the last whorl; chambers crescent-shaped, triangular to trapezoidal in the end of the last whorl, with flat and smooth surface; chambers increasing slowly in size as added. Lateral

view : Trochospire very low; profile strongly asymmetrical; one peripheral keel, often less pronounced on last chambers. Size : 0.5–0.6 mm.

Locality : Manipur, Ukhrul District, Hundung North and South, Kangkhui and Mova limestones.

Geological horizon : Late Cretaceous (Maastrichtian).

13. *Globotruncanita calcarata* (Cushman)

1927. *Globotruncana calcarata* Cushman, *Contr. Cush. lab. Foram. Res.*, 3 (2) No. 41 : 115.
1984. *Globotruncanita calcarata* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.* 26 (3-4) : 224.

Diagnosis : Umbilical side: Primary aperture umbilical; sutures straight, becoming curved towards end of the whorl, depressed; 5–8 chambers, trapezoidal, bearing tubulospines, pustulose surface; adumbilical ridges more or less developed on all chambers, sutural ridges enveloped generally by succeeding chambers; umbilicus one-third to half of maximum diameter; umbilical system composed of large, flat and inbricated portici with their edges partly merging inside the umbilicus. Spiral side : Outline polygonal, of variable aspect depending on the development of tubulospines produced by posterior part of each chamber, largest tubulospine often in the older part of the last whorl; sutures straight, sometime sinuous, joining spiral suture at acute angles; chambers triangular with a flat and smooth surface in the last whorl, globular in the first whorls; chambers increasing moderately in size as added. Lateral view : Trochospire low; profile asymmetrical, spiral side slightly convex to slightly concave, umbilical side generally strongly convex; one peripheral keel. Size : 0.4–0.7 mm.

Locality : Manipur, Ukhrul District, Hundung North limestone.

Geological horizon : Late Cretaceous (Campanian).

14. *Globotruncanita conica* (White)

1928. *Globotruncana conica* White, *J. Paleontol.*, 2 : 285.
 1984. *Globotruncanita conica* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol* 26 (3-4) : 226

Diagnosis : Umbilical side : Primary aperture umbilical; sutures straight, but curved near umbilicus, lined by a row of pustules; 6–9 chambers, trapezoidal, with a flat and smooth surface; adumbilical ridges moderately developed on all chambers, tangential and almost touching one another, sutural ridges generally enveloped by succeeding chambers; umbilicus one-third of maximum diameter; umbilical system composed of trumpet-shaped portici, merging inside the umbilicus. Spiral side : Outline practically circular; sutures straight to slightly curved, raised and beaded, joining spiral suture at right angle; chambers trapezoidal to subrectangular, with a flat and smooth surface; chambers increasing very slowly in size as added. Lateral view : Trochospire high; profile asymmetrical, spiral side strongly convex and umbilical side practically flat; one peripheral keel. Size : 0.6–0.8 mm.

Locality : Manipur, Ukhrul District, Mova limestones.

Geological horizon : Late Cretaceous (Maastrichtian).

15. *Globotruncanita elevata* (Brotzen)

1934. *Rotalia elevata* Brotzen, *Deutsch. ver. Zeitschr.*, 57 : 66.
 1984. *Globotruncanita elevata*: Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.*, 26 (3-4) : 228.

Diagnosis : Primary aperture umbilical; sutures curved, generally depressed, lined by a raised sutural ridge in first half of the whorl; 5–9 chambers, trapezoidal, with a smooth and convex to flat surface; adumbilical ridges often developed on all chambers, tangential to slightly oblique, sutural ridges enveloped by succeeding chambers towards end of the whorl; umbilicus one-third to half of maximum diameter; umbilical system composed of trumpet-shaped portici, merging

inside the umbilicus. Spiral side : Outline slightly lobate; sutures oblique, straight to curved, raised and beaded, joining the spiral suture at acute angle but at right angle towards end of the last whorl; umbilicus one-third to half of maximum diameter; umbilical system composed of trumpet shaped portici, merging inside the umbilicus. Spiral side : Outline slightly lobate; sutures oblique, straight to curved, raised and beaded, joining the spiral suture at acute angle but at right angle towards end of the last whorl; chambers triangular to crescentic, with a smooth and flat surface; chambers increasing slowly in size as added. Lateral view: Trochospire low; profile strongly asymmetrical, spiral side flat to concave in the last whorl ; one peripheral keel. Size : 0.6–0.9 mm.

Locality : Manipur, Ukhrul District, Hundung North limestone.

Geological horizon : Late Cretaceous (Santonian to Campanian).

16. *Globotruncanita pettersi* (Gandolfi)

1955. *Globotruncana rosetta pettersi* Gandolfi, *Bull. Amer. Pal.*, 35 (155) : 68.
 1984. *Globotruncanita pettersi* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.* 36 (3-4) : 232.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures straight to curved, depressed, lined by a slightly raised sutural ridge in earlier part of the whorl; 4–5 chambers, scattered rugosities; adumbilical ridges little developed, tangential to oblique; umbilicus one-third to half of the maximum diameter; umbilical system composed of trumpet shaped or flattened portici, merging inside the umbilicus by their distal edges. Spiral side : Outline lobate to slightly lobate, suture more or less curved, raised and beaded, joining the spiral suture at acute angles; chambers more or less elongated, crescentic, with a flat and smooth surface; chamber increasing rapidly in size as added. Lateral view : Trochospire very low; profile distinctly asymmetrical, spiral side flat to little convex, umbilical side strongly convex; one peripheral keel, sometimes lined by a row of

small pustules at the umbilical side. Size : 0.4–0.6 mm.

Locality : Manipur, Ukhrul District, Mova limestones

Geological horizon : Late Cretaceous (Maastrichtian).

17. *Globotruncanita stuarti* (de Lapparent)

1918. *Rosalina stuarti* de Lapparent, *Serv. Carte geol. France., Mem* : 11.

1984. *Globotruncanita stuarti* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.*, **26** (3-4) : 234.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures straight but slightly curved near umbilicus, slightly depressed but lined by sutural ridges; 7-9 chambers, trapezoidal, with a flat to smooth surface; adumbilical ridges developed on all chambers, tangential and almost in continuity; umbilicus one-third to half of the maximum diameter, umbilical system composed of trumpet-shaped portici merging inside the umbilicus. Spiral side : Outline typically circular to subpolygonal; sutures straight, raised and beaded, joining the spiral suture almost at right angles; chambers trapezoidal to subrectangular, with a flat and smooth surface; chambers increasing very slowly in size as added. Lateral view : Trochospire moderately high; profile symmetrical, but sometimes with a more convex umbilical side ; one peripheral keel. Size : 0.7–0.9 mm.

Locality : Manipur, Ukhrul District, Hundung North and Mova limestones.

Geological horizon : Late Cretaceous (Maastrichtian).

18. *Globotruncanita stuartiformis* (Dalbiez)

1955. *Globotruncana elevata stuartiformis* Dalbiez, *Micropaleontology*, **1** (2) : 169

1984. *Globotruncanita stuartiformis* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.*, **26** (3-4) : 238

Diagnosis : Primary aperture umbilical; sutures curved, generally depressed but lined by raised sutural ridges; 5–7, sometimes 8 chambers,

subtrapezoidal, with a smooth and flat to slightly convex surface; adumbilical ridges developed on all chambers, tangential to oblique, sutural ridges raised; umbilicus one-third of the maximum diameter; umbilical system composed of trumpet-shaped portici, merging inside the umbilicus. Spiral side : Outline subcircular, suture straight, raised and beaded, joining the spiral suture at very acute angle; chambers typically triangular, with a smooth and flat surface; chambers increasing slowly in size as added. Lateral view : Trochospire of moderate height; profile symmetrical to slightly asymmetrical due to a higher convexity of one side or the other; one peripheral keel, two close rows of beads on the first chambers of the last whorl. Size : 0.5–0.8 mm.

Locality : Manipur, Ukhrul District, Hundung North and Mova limestones.

Geological horizon : Late Cretaceous (Santonian to Maastrichtian).

19. *Globotruncanita subspinoso* (Pessagno)

1960. *Globotruncana subspinoso* Pessagno, *Micropaleontology*, **6**(1) : 101.

1984. *Globotruncanita subspinoso* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.*, **26** (3-4) : 240

Diagnosis : Umbilical side : Primary aperture umbilical; sutures slightly curved, depressed, sometimes lined by a row of pustules; 5–8 chambers, trapezoidal, generally with a flat and smooth surface; adumbilical ridges developed on all chambers, tangential, sutural ridges often enveloped by succeeding chambers, except between the first chambers; umbilicus one-third to half of the maximum diameter; umbilical system composed of trumpet-shaped portici, merging inside the umbilicus. Spiral side : Outline strongly lobate, angularly polygonal with asymmetrical concave sides; sutures straight, raised and beaded, joining the spiral side at acute angles; chambers triangular to trapezoidal, radially elongated with a smooth and undulated surface; chambers increasing at variable rates in size as added. Lateral view : Trochospire low; profile

strongly asymmetrical, spiral side flat or slightly convex, umbilical side convex; one peripheral keel. Size : 0.5–0.6 mm. but often larger (0.8–1.0 mm).

Locality : Manipur, Ukhrul District, Hundung North limestone.

Geological horizon : Late Cretaceous (Campanian–Maastrichtian).

Genus *Rosita* Caron, Gonzalez Donoso, Robaszynski & Wonders

1984. *Rosita* Caron, Gonzalez Donoso, Robaszynski & Wonders, *Rev. de Micropaleontol.* **26** (3-4) : 244.

20. *Rosita contusa* (Cushman)

1926. *Pulvinulina arca* var. *contusa* Cushman, *Contr. Cush. Lab. Foram. Res.* **2**, pt. 1 No. **2b** : 23.

1984. *Rosita contusa* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.*, **26** (3-4) : 246.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures curved to subradial, slightly depressed and not lined by pustules; 5–7 chambers, sometimes 4 and rarely upto 9, subtrapezoidal, with a flat, smooth to pustulose surface; adumbilical ridges poorly developed; umbilicus one-third to half of the maximum diameter; umbilical system composed of more or less flattened portici, imbricated, with their distal edges merging inside the umbilicus. Spiral side : Outline variable depending on undulation of the chambers, subcircular to polygonal; sutures curved and oblique, raised and beaded, joining the spiral suture at variably acute angles; chambers globular initially, then strongly elongated in the direction of coiling to the end of the last whorl; chambers increasing slowly in size as added. Lateral view : Trochospire very high; profile very asymmetrical, spiral side strongly convex, umbilical side flat to concave; two keels, closely spaced and equally developed on all chambers. Size : 0.7–1.5 mm.

Locality : Manipur, Ukhrul District, Mova limestone.

Geological horizon : Late Cretaceous (Maastrichtian).

21. *Rosita fornicata* (Plummer)

1931. *Globotruncana fornicata* Plummer, *Texas Univ. Bull.* No. **3101** : 130.

1984. *Rosita fornicata* : Robaszynski, Caron, Gonzalez Donoso & Wonders *Rev. de Micropaleontol.*, **26** (3-4) : 250.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures curved, generally slightly depressed but often lined by pustules or sometimes by a sutural ridge towards the end of the whorl; 4–5 chambers, sometimes 3 and rarely upto 7, kidney-shaped, elongated in the direction of coiling; adumbilical ridges developed on all chambers except sometimes on the last one, tangential to oblique, sutural ridges sometimes enveloped by succeeding chambers; umbilicus one-third to half of the maximum diameter; umbilical system composed of large portici, more or less flattened and imbricated. Spiral side : Outline slightly lobate, subpolygonal to circular; sutures curved to straight, very oblique, raised and beaded, joining the spiral suture at acute to right angles; chambers globular initially, those of last whorl crescentic, with a smooth and undulated surface; chambers increasing rapidly in size as added. Lateral view : Trochospire low to moderate high; profile asymmetrical, spiral side and umbilical side variably convex; two equally developed keels on all chambers, keels separated by an imperforate peripheral band of variable width. Size : 0.4–0.5 mm, sometimes up to 0.7 mm.

Locality : Manipur, Ukhrul District, Hundung North limestone.

Geological horizon : Late Cretaceous (Maastrichtian).

22. *Rosita patelliformis* (Gandolfi)

1955. *Globotruncana contusa patelliformis* Gandolfi, *Bull. Amer. Pal.*, **35** (155) : 54

1984. *Rosita patelliformis* : Robaszynski, Caron, Gonzalez Donoso & Wonders *Rev. de Micropaleontol.*, **26** (3-4) : 252.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures curved to subradial, slightly

depressed but lined by a row of pustules; 4-5 chambers, trapezoidal, elongated surface; adumbilical ridges poorly developed but present on almost all chambers, tangential, sutural ridges enveloped by more or less by succeeding chambers; umbilicus one-third to half of the maximum diameter; umbilical system with flattened portici. Spiral side : Outline subpolygonal to circular; suture curved, oblique, lined by slightly raised and beaded sutural ridges, joining the spiral suture at acute to right angles; chambers globular initially, those of last whorl elongated, crescentic, with a smooth and undulated surface; chambers increasing rapidly in size as added. Lateral view : Trochospire moderately to fairly high; profile asymmetrical, spiral side convex, umbilical side flat to concave; two keels, equally developed on all chambers. Size : 0.6–1.0 mm.

Locality : Manipur, Ukhrul District, Hundung North and Mova limestones.

Geological horizon : Late Cretaceous (Campanian-Maastrichtian).

Genus *Hedbergella* Brönniman & Brown

1958. *Hedbergella* Brönniman & Brown, *Washington Acad. Sci. Journ.*, **48** (1) : 15-17.

23. *Hedbergella holmdelensis* Olsson

1964. *Hedbergella holmdelensis* Olsson, *Micropaleontology*, **10** (2) : 160

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical, arcuate, bordered by a thin lip; sutures radial, depressed; 5-6 chambers, globular to trapezoidal, with a smooth and finely perforate surface; umbilicus one-eighth of the maximum diameter. Spiral side : Outline lobate; sutures depressed, curved on the early whorls, radial and straight on the last whorl, joining the spiral suture almost at right angles; chambers moderately inflated, elongated in the direction of coiling; chambers slowly increasing in size in the early whorls, rapidly increasing in the last whorl. Lateral view : Trochospire very low to flat; profile slightly asymmetrical with umbilical side little more convex; chamber periphery oval in the first

chambers, rounded in the last ones; primary aperture partially straddling the periphery. Size : 0.2–0.3 mm.

Locality : Manipur, Ukhrul District, Hundung limestone.

Geological horizon : Santonian–Maastrichtian, possibly crossing Cretaceous–Paleocene boundary.

24. *Hedbergella flandrini* Porthault

1970. *Hedbergella flandrini* Porthault, *Geobios*, **3** : 64-65.

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical extending to the periphery, lip well developed; sutures generally radial and depressed; 5-6 chambers, spatulate in shape except the first of the last whorl, which is globular; surface smooth; umbilicus about one-fifth of the diameter of the test. Spiral side : Equatorial periphery very lobulate; sutures radial and depressed; chambers spatulate in shape, increasing very rapidly in size as added. Lateral view : Compressed, slightly biconvex, almost symmetrical, chamber outline ogival. Size : 0.4–0.5 mm.

Locality : Manipur, Ukhrul District, Kangkhui Section.

Geological horizon : Late Cretaceous (Maastrichtian).

Genus *Abathomphalus* Bolli, Loeblich & Tappan

1957. *Abathomphalus* Bolli, Loeblich & Tappan, *U.S. Natl. Mus. Bull.* No. 215 : 43

25. *Abathomphalus intermedius* (Bolli)

1950. *Globotruncana intermedia* Bolli, *B.W.I. Journ. Pal.*, **25**(2) : Pl.35

1984. *Abathomphalus intermedius* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.*, **26**(3-4) : 272.

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical; sutures radial, depressed; 4-6 chambers, trapezoidal, with a convex surface ornamented with rugosities; umbilicus about one-fourth of the maximum diameter; umbilical system composed of portici which are coalescent to a

variable extent. Spiral side : Outline slightly lobate; sutures curved, raised at first and later ones depressed, joining the spiral suture at right angles; chambers petaloid, surface slightly inflated to convex, ornamented with elongated rugosities. Lateral view : Trochospire low to moderately high, profile generally biconvex, sometimes asymmetrical, with a convex spiral side and a slightly convex, flat or concave umbilical side; two keels, parallel, composed of radially arranged rugosities, keel band tilted towards the umbilicus. Size : 0.3–0.6 mm.

Locality : Manipur, Ukhrul District, Mova limestones.

Geological horizon : Late Cretaceous (Maastrichtian).

26. *Abathomphalus mayaroensis* (Bolli)

1951. *Globotruncana mayaroensis* Bolli, *Jour. Pal.*, 25(2) : 198.

1957. *Abathomphalus mayaroensis* : Bolli, Loeblich & Tappan, *Bull. U.S. Natl. Mus.*, 215 : 43

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical; sutures radial to slightly curved or sinuous, depressed; $4\frac{1}{2}$ –6 chambers, often 5, trapezoidal, with a flat surface, ornamented with rugosities arranged in a meridional pattern; umbilical system composed of portici which merge to a variable extent; diameter of umbilicus difficult to assess. Spiral side : Outline lobate; sutures curved and raised, lined by obliquely arranged rugosities, joining the spiral sutures at right angles; first chambers of the last whorl crescentic type, last ones more petaloid, ornamented with pustules or elongated rugosities; chambers slowly increasing in size as added. Lateral view : Trochospire very low; profile almost symmetrical, with a more or less concave umbilical side and a flat to concave spiral side; two keels composed of radially arranged rugosities, equally developed on all chambers. Size : 0.5–1.0 mm.

Locality : Manipur, Ukhrul District, Mova limestone.

Geological horizon : Late Cretaceous (Maastrichtian).

Genus *Archaeoglobigerina* Pessagno

1967. *Archaeoglobigerina* Pessagno, *Paleont. Amer.* 5 (37) : 315.

27. *Archaeoglobigerina blowi* Pessagno

1967. *Archaeoglobigerina blowi* Pessagno, *Paleont. Amer.*, 5 (37) : 316.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures radial, depressed; 4–5 chambers, globular, with a rugose surface; umbilicus one-fourth to one-third of maximum diameter; umbilical system composed of tegilla. Spiral side : Outline lobate; sutures radial, depressed; chambers globular, with a rugose surface, pustules and rare costellae never arranged in a meridional pattern; chambers slowly increasing in size in the first whorls, increasing very rapidly in the last one. Lateral view : Trochospire low to flat; profile almost symmetrical; chambers periphery rounded, occasionally lined with two very faint rows of pustules. Size : 0.4–0.5 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestones, Kangkhui, Hundung.

Geological horizon : Upper part of Coniacian to upper part of Maastrichtian, possibly crossing Cretaceous – Paleocene boundary.

Genus *Rugoglobigerina* Brönnimann

1952. *Rugoglobigerina* Brönnimann, *B.W.I. Bull. Amer. Pal.* 34(140): 16.

28. *Rugoglobigerina hexacamerata* Brönnimann

1952. *Rugoglobigerina hexacamerata* Brönnimann, *Bull. Amer. Pal.*, 34 (140) : 23.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures radial and depressed; typically 6 chambers, globular, with a surface covered by rugosities and costellae; umbilicus one-third to half of the maximum diameter; umbilical system composed of tegilla with both proximal and distal infralaminar accessory apertures. Spiral side : Outline lobate; sutures radial and depressed; chambers globular, with a surface covered by rugosities and costellae; chambers increasing slowly in size as added. Lateral view : Trochospire

low to flat; profile slightly biconvex, almost symmetrical with spiral side more convex; chamber periphery rounded, sometimes with two rows of rugosities separated by a variably thick imperforate peripheral band on the first chamber of the last whorl. Size : 0.3–0.4 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

29. *Rugoglobigerina macrocephala* Brönnimann

1952. *Rugoglobigerina macrocephala macrocephala* Brönnimann *Bull. Amer. Pal.*, **34** : 25.

Diagnosis : Primary aperture umbilical; sutures radial and depressed; 3–3½ chambers, exceptionally 4, chambers globular with a surface covered by thick rugosities and costellae; umbilicus generally less than one-fourth of the maximum diameter; umbilical system composed of tegilla with both proximal and infralaminar accessory apertures. Spiral side : Outline lobate; sutures radial and depressed; chambers globular, with a surface covered by thick, rugosities and costellae arranged in meridional pattern; chambers increasing very rapidly in size as added, with prominent last chamber. Lateral view : Trochospire low to flat; profile biconvex, slightly asymmetrical with spiral side more convex; chamber periphery rounded, sometimes with two rows of rugosities. Size : 0.3–0.4 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

Genus *Gansserina* Caron, Gonzalez Donoso, Robaszynski & Wonders

1984. *Gansserina* Caron, Gonzalez Donoso, Robaszynski & Wonders, *Rev. de Micropaleontol.*, **26** (3-4) : 292.

30. *Gansserina gansseri* (Bolli)

1951. *Globotruncana gansseri* Bolli, *Jour. Pal.*, **25**(2) : 96.

1984. *Gansserina gansseri* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.*, **26** (3-4) : 294.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures radial and depressed; 4–7 chambers, rarely 8, trapezoidal, with somewhat hemispherical surface, covered with thick pustules and rarely rugosities; adumbilical ridges absent; umbilicus about one-third of maximum diameter; umbilical system composed of trumpet-shaped portici with their distal edges merging inside the umbilicus, tegilla sometimes present in the end of the last whorl. Spiral side : Outline slightly lobate; sutures curved, commonly raised, but sometimes slightly depressed, marked by sutural ridges, joining the spiral side at acute to right angles; chambers petaloid to crescentic with a flat surface, often provided with a central bulge; chambers increasing rapidly in size as added. Lateral side : Trochospire very low; profile strongly asymmetrical with a flat to slightly concave, rarely convex spiral side and a convex umbilical side; one keel on all chambers of the last whorl. Size : 0.3–0.6 mm.

Locality : Manipur, Ukhrul District, Kangkhui, Hundung South and Mova sections.

Geological horizon : Late Cretaceous (Maastrichtian).

31. *Gansserina wiedenmayeri* (Gandolfi)

1955. *Globotruncana wiedenmayeri wiedenmayeri* Gandolfi, *Bull. Amer. Pal.*, **35** (155) : pl. 7

1984. *Gansserina gansseri* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.*, **26** (3-4) : 298.

Diagnosis : Umbilical side : Primary aperture umbilical; sutures straight, radial to oblique, depressed; 5–7 chambers, exceptionally 8, subtrapezoidal, very pustulose surface; adumbilical ridges virtually absent, but sometimes an imperforate adumbilical margin; umbilicus one-third to half of the maximum diameter; umbilical system composed of trumpet-shaped portici merging inside the umbilicus with their distal edges. Spiral side : Outline slightly lobate to subcircular; sutures curved to straight, raised, joining the spiral sutures at acute angles; Chambers petaloid, with a smooth, flat to slightly convex surface; chambers increasing slowly in

size as added. Lateral view : Trochospire very low; profile strongly asymmetrical, with a flat to very slightly convex spiral side and a convex umbilical side; two keels about equally developed, separated by a narrow imperforate peripheral band. Size : 0.4–0.5 mm.

Locality : Manipur, Ukhrul District, Mova limestone.

Geological horizon : Late Cretaceous (Maastrichtian).

Genus *Globotruncanella* Reiss

1957. *Globotruncanella* Reiss, *Cush. Found. Foram. Res. Contr.*, 8 pt. 4 : 135.

32. *Globotruncanella havanensis* (Woorwijk)

1937. *Globotruncana havanensis* Woorwijk, *K. Akad. Wetensch. Amsterdam. Proc.*, Ser. B, 40 : 195.
1984. *Globotruncanella havanensis* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.*, 26 (3-4) : 265.

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical; sutures radial, depressed; 4 ½ to 5 chambers, triangular to trapezoidal, subglobular, with a surface bearing pustules and sometimes rugosities; umbilicus less than one-fourth of the maximum diameter; umbilical system composed of portici, sometimes free but often merging at their umbilical and/or posterior edges. Spiral side : Outline lobate; sutures radial to curved, depressed, joining the spiral suture at right angles; chambers petaloid, with a surface bearing pustules and rarely rugosities; chambers increasing rapidly in size as added. Lateral view : Trochospire low to moderately high; profile biconvex, with spiral side convex, umbilical side slightly convex to flat. Size : 0.3–0.4 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

33. *Globotruncanella petaloidea* (Gandolfi)

1956. *Globotruncana (Rugoglobigerina) petaloidea petaloidea* Gandolfi, *Bull. Amer. Pal.*, 35 (155) : 52.

1984. *Globotruncanella petaloidea* : Robaszynski, Caron, Gonzalez Donoso & Wonders, *Rev. de Micropaleontol.* 26 (3-4) : 268.

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical, sometimes almost peripheral; sutures radial, depressed; 4 chambers, trapezoidal, subglobular, with a surface bearing scattered pustules; umbilicus less than one-fourth of the maximum diameter; umbilical system composed of partially coalescing portici. Spiral side : Outline strongly lobate; sutures radial, depressed; chambers petaloid, with a surface bearing pustules, except on the last chambers; chambers increasing very rapidly in size as added. Lateral view : Trochospire moderately to very high; profile biconvex to concave-convex, slightly to strongly asymmetrical, with spiral side more convex than umbilical side, sometimes a narrow imperforate peripheral band on the last whorl. Size : 0.40–0.45 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

34. *Globotruncanella pschadae* (Keller)

1946. *Globorotalia pschadae* Keller, *Byull. mosk. Obshch. Ispyt. Priro. n.* 8. 51, (sect. geol. 21 : 3), p.99.
1984. *Globotruncanella pschadae* : Robaszynski, Caron, Gonzalez Donoso Wonders, *Rev. de Micropaleontol.*, 26 (3-4) : 269.

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical; sutures radial, depressed; 4 ½ to 5 chambers, triangular to trapezoidal, with a surface bearing scattered pustules and rugosities; umbilicus less than one-fourth of the maximum diameter; umbilical system composed of partly or entirely coalescing portici. Spiral side : Outline lobate; sutures radial, curved and oblique towards the end of the last whorl, depressed; chambers petaloid, with a surface bearing pustules and rugosities; chambers rapidly increasing in size as added. Lateral view : Trochospire low to moderately high; profile biconvex, slightly asymmetrical, with spiral side more convex than umbilical side; chamber periphery angular, marked

by a keel composed of a row of meridional pustules. Size : 0.35–0.45 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

Genus *Dicarinella* Porthault

1970. *Dicarinella* Porthault, *Geobios*, 3 : 41–106.

35. *Dicarinella asymetrica* (Sigal, 1952)

Diagnosis : Umbilical side : Primary aperture umbilical to slightly extraumbilical, bordered by well developed portici; sutures radial and depressed; 5-6 strongly inflated chambers with a rugose surface; umbilicus atleast one-third of maximum diameter. Spiral side : Equatorial periphery lobulate; sutures oblique, meeting the inner whorl perpendicularly, slightly thickened to gently beaded; chambers petaloid, slowly increasing in size as added. Lateral view : Clearly asymmetrical, plano-convex to concavo-convex, low trochospire; two close keels separated by a thin imperforate peripheral band; periumbilical ridge truncates clearly the profile which becomes subrectangular. Size : 0.6–0.7 mm.

Locality : Manipur, Ukhrul District, Kangkhui Section.

Geological horizon : Late Cretaceous (Santonian-Campanian).

Genus *Marginotruncana* Hofker

1956. *Marginotruncana* Hofker, *J. Paleontol.* 30 : 891–958.

36. *Marginotruncana coronata* (Bolli)

1945. *Globotruncana coronata* Bolli, *Ecologiae geol. Helvetiae*, 37 : 217–328.

1967. *Marginotruncana coronata* : Pessagno, *Paleontogr. Amer.* 5 (37) : 245–445.

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical; umbilicus surrounded or covered by portici which may coalesce to form tegilla; sutures sigmoid, curved to form U-Shape;

raised; 6-8 reniform chambers with a flat to concave surface; umbilicus about one-third of the maximum diameter. Spiral side : Equatorial periphery somewhat lobulate; sutures raised, curved, joining the preceding spiral suture almost at right angles; chambers typically petaloid with a flat to concave surface; chambers slowly and regularly increasing in size as added. Lateral view : Low trochospire, profile almost symmetrical; two keels separated by a narrow imperforate peripheral band. Size : 0.6–0.8 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous.

37. *Marginotruncana marginata* (Reuss)

1846. *Rosalina marginata* Reuss, *Die Versteinerungen der böhmischen Kreideformation.*, pl. 2 : 36

1967. *Marginotruncana marginata* : Pessagno, *Paleontogr. Amer.*, 5 (37): 245–445.

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical, portici more or less well developed; sutures depressed appearing radial, but marked by largely U-shaped sigmoidal rims; 5-8 globular chambers with surface smooth or very slightly rugose; umbilicus less than one-fourth to more than one-third of the maximum diameter. Spiral side : Equatorial periphery lobulate; sutures depressed to slightly raised, oblique; chambers petaloid, globular, irregularly increasing in size as added. Lateral view : Biconvex, low trochospire; two slightly developed keels separated by a narrow peripheral band which sometimes often does not truncate globular profile of the chamber. Size : 0.4–0.8 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous.

38. *Marginotruncana pseudolinneiana* Pessagno

1967. *Marginotruncana pseudolinneiana* Pessagno, *Paleontogr. Amer.*, 5 (37) : 245–445.

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical; umbilicus surrounded or

covered by portici leaving accessory infralaminar apertures between them; sutures sigmoid, raised; 5-7 reniform chambers, sometimes 8; umbilicus rather wide, one-fourth to one-third of the largest diameter. Spiral side : Equatorial periphery slightly lobulate; sutures raised, curved joining the preceding spiral sutures at a rather low angle; chambers somewhat elongate, surface flat but occasionally little concave; chambers increasing rather irregularly in size as added. Lateral view : Low trochospire, with a characteristically rectangular outline; two keels separated by a wide, imperforate peripheral band. Size : 0.5–0.7 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous.

39. *Marginotruncana sinuosa* Porthault

1970. *Marginotruncana sinuosa* Porthault; *Geobios*, 3 : 81.

Diagnosis : Umbilical side : Primary aperture extraumbilical-umbilical; umbilical surrounded by portici; sutures sigmoid and V-shaped, raised, sutural ridges continuing around the umbilical depression; 5-6 imbricated chambers, strongly elongated in the direction of coiling; umbilicus forming about one-third of the maximum diameter. Spiral side : Equatorial periphery subcircular; sutures curved, very oblique in relation to the preceding spiral suture, raised; chambers strongly elongated in the direction of coiling with a flat or undulated surface; chambers increasing slowly in size as added. Lateral view : Slightly high trochospire, somewhat asymmetrically biconvex; two keels forming a sinuous outline, closely spaced on the posterior part of the chamber, diverging on the anterior part where they are separated by an imperforate peripheral band. Size : 0.5–0.7 mm.

Locality : Manipur, Ukhrul District, Kangkhui Section.

Geological horizon : Late Cretaceous.

40. *Marginotruncana undulata* (Lehman, 1963)

Diagnosis : Umbilical side : Primary aperture

extraumbilical-umbilical; umbilicus surrounded by portici; sutures raised, sigmoid, typically showing a V-shaped pattern continuing in ridges surrounding the umbilicus; 5-7 subrectangular chambers becoming reniform; umbilicus forming about one-third to one-fourth of the maximum diameter. Spiral side : Equatorial periphery only slightly lobulate, polygonal to subcircular; marginal keel of each chamber straight or slightly curved forming an angle with its sutural continuation; sutures forming a rather low angle with the preceding spiral suture; chambers trapezoidal and with an undulated surface; chambers slowly increasing in size as added. Lateral view : Moderately high trochospire; biconvex, slightly asymmetrical, with undulated chamber surfaces; single keel formed by a double row of alternating pustules, becoming very closely spaced in the later part of the test. Size : 0.6–0.8 mm.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous.

Family HETEROHELICIDAE

Genus *Planoglobulina* Cushman

1927. *Planoglobulina* Cushman, *Contr. Cushman Lab. Foram. Res.*, 2 (4) : 77.

41. *Planoglobulina acervulinoides* (Egger, 1899)

Diagnosis : Early stage coiled in microspheric form, later biserial, and finally with chamber proliferation in plane of biseriality, resulting in flabelliform test; exterior commonly ornamented with longitudinal striae; aperture multiple, on final series of chambers.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Cretaceous.

Genus *Pseudoguembelina* Brönnimann & Brown

1953. *Pseudoguembelina* Brönnimann & Brown, *Contr. Cushman Lab. Foram. Res.*, 4(4) : 150.

42. *Pseudoguembelina excolata*

(Cushman 1926)

Diagnosis: Test biserial in adult, rarely with microspheric coil in early stage; chambers subglobular; surface generally with longitudinal striae or costae; aperture an interiomarginal arch, extending laterally, secondary sutural apertures may occur near zigzag suture between pairs of chambers.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

43. *Pseudoguembelina* sp.

Diagnosis: Test biserial in adult, rarely with microspheric coil in early stage; chambers subglobular; surface with longitudinal striae or costae; aperture an interiomarginal arch, extending laterally, secondary sutural apertures often occur near zigzag suture between pairs of chambers.

Locality : Manipur, Ukhrul District, Kangkhui, Hundung and Mova limestones

Geological horizon : Upper Cretaceous.

Genus *Pseudotextularia* Rzehak

1891. *Pseudotextularia* Rzehak, *Naturhist. Hafmuseum* 6 : 4.

44. *Pseudotextularia elegans* Rzehak

1891. *Pseudotextularia elegans* Rzehak, *Naturhist., Hafmuseum*, 6 : 4.

Diagnosis : This species has a biserial test with the chambers increasing gradually in size as added, rapidly becoming greater in thickness than in height. Surface covered with distinct continuous costae with small pores and sutures slightly depressed. The aperture is low, wide arc bordering the crest of the second last chamber, chambers inflated.

Locality : Manipur Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

45. *Pseudotextularia intermedia* De Klsz

1953. *Pseudotextularia intermedia* De Klsz, *Geologica Bavarica*, 17 : 223-234.

Diagnosis : This species differs from other *Pseudotextularia* in having a set of multiserial chamberlets present as a terminal stage.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

46. *Pseudotextularia nuttali* (Voorwijk, 1937)

Diagnosis : This species differs from other *Pseudotextularia* in having the last three chambers which increase rapidly in size as added.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Kangkhui, Hundung.

Geological horizon : Late Cretaceous (Maastrichtian).

Genus *Racemiguembelina* Montanaro Gallitelli

1957. *Racemiguembelina* Montanaro Gallitelli, *U.S. Natl. Mus. Bull.* 215 : 142.

47. *Racemiguembelina fructicosa* (Egger)

1899. *Guembelina fructicosa* Egger, K. Bayer, *Akad. Wiss., Munchen, Math.-Phys. Cl. Abhandl.*, 21 (3) : 35.

1957. *Racemiguembelina fructicosa* : Montanaro Gallitelli, *U.S. Natl. Mus. Bull.*, 215 : 142.

Diagnosis : Test subconical, early stage often planispiral in microspheric forms, later biserial with globular chambers increasing regularly in size and with proliferation at crown perpendicular to previous axis of growth; surface generally ornamented by longitudinal striae or costae; aperture on interiomarginal arch on one or many of terminal chambers.

Locality : Manipur, Ukhrul District, Mova limestones.

Geological horizon : Upper Cretaceous.

Genus *Gublerina* Kikoine

1948. *Gublerina* Kikoine *Soc. geol. France*, (5) 18 (1-3) : 26.

48. *Gublerina* sp.

Diagnosis : Test compressed, flabelliform, increasing rapidly in breadth: early stage planispiral, later biserial, with two series of chambers diverging widely, leaving broad nonseptate or incompletely divided central region, final stage generally with chamber proliferation; sutures commonly thickened, nodose and elevated; wall calcareous, perforate, radial in structure, bilamellar, with double septa and septal peristomal canal; aperture arched.

Locality : Manipur, Ukhrul District, Kangkhui, Hundung and Mova limestones.

Geological horizon : Upper Cretaceous.

Genus *Heterohelix* Ehrenberg

1843. *Heterohelix* Ehrenberg, *K. Preuss. Akad. Wiss. Berlin, Abhandl.*, (1841), pl. 1 : 429.

49. *Heterohelix* sp.

Diagnosis : Early stage biserial, later develop chamber proliferation; aperture simple and interiomarginal.

Locality : Manipur, Ukhrul District, Kangkhui, Hundung and Mova limestones.

Geological horizon : Late Cretaceous.

Family NUMMULITIDAE

Genus *Nummulites* Lamarck

1801. *Nummulites* Lamarck, *Systeme des animaux sans vertebres*, Paris, : 101.

50. *Nummulites* sp.

Diagnosis : Test involute to evolute ; median chambers numerous, simple; without distinct lateral chambers, spiral sheet with or without vacuoles

Locality : Manipur, Ukhrul District, Paoyi.

Geological horizon : Paleocene to Recent.

Family DISCOCYCLINIDAE

Genus *Discocyclus* Gümbel.

1870. *Discocyclus* Gümbel, *K. Bayer. Akad. Wiss. Cl. II*, 10 (2) : 687.

51. *Discocyclus* sp.

Diagnosis : Test circular in plan, discoidal or lenticular, with or without radiating ribs; annular stolon proximally situated; radial chamber walls of equatorial chambers in adjacent annuli usually alternating in position.

Locality : Manipur, Ukhrul District, Paoyi.

Geological horizon : Paleocene to Recent.

Family BOLIVINITIDAE

Genus *Bolivina* d'Orbigny

1839. *Bolivina* d'Orbigny, *Voyage dans l'Amerique Meridionale- Foraminiferes*, 5 (5) : 60

52. *Bolivina* sp.

Diagnosis : Test elongate, rather compressed; chambers broad, low, biserially arranged throughout, basal margins of chambers with retral process or backwardly directed chamber overlaps; wall calcareous perforate, radial in structure, smooth striate, or costate with marginal keel; aperture a narrow, elongate loop up chamber face, one margin ending blindly or bent upward as collar, opposite border attached to one side of doubly folded internal tooth plate (U-shaped in section), attached half of tooth plate projecting through aperture at one extremity and bisecting it, narrowing rapidly inward, tooth plate eventually trough-shaped structure with concave portion alternately turning from one side to opposite in successive chambers.

Locality : Manipur, Ukhrul District, Paoyi.

Geological horizon : Cretaceous to Recent.

Family TEXTULARIIDAE

Genus *Vulvulina* d'Orbigny

1826. *Vulvulina* d'Orbigny, *Ann. Sci. Nat. Paris*, (1) 7 : 264.

53. *Vulvulina* sp.

Diagnosis : Test free, flaring or elongate, lozenge-shaped or rhomboidal in section, lateral margins acutely angled; chambers increasing

rapidly in size, early portion coiled at least in microspheric generation, later chambers biserially arranged, broad and low, somewhat arched over early coil, recurved laterally, final chambers uniserial and some show biserial development; sutures distinct, commonly thickened and elevated in early portion, later moderately depressed; wall agglutinated, but very finely grained and smoothly finished, of calcareous, arenaceous or other mineral grains; aperture in early stage broad, low, interiomarginal arch, in uniserial stage becoming elongate, narrow terminal slit.

Locality : Manipur, Ukhrul District, Paoyi.

Geological horizon : Upper Cretaceous to Recent.

Genus *Textularia* DeFrance in De Blainville

1824. *Textularia* DeFrance in De Blainville, *Dictionnaire des Sciences Naturelles*, 32 : 177.

54. *Textularia* sp.

Diagnosis : Test free, elongate, biserial, generally more or less compressed in plane of biseriality or rarely oval to circular in cross section; chambers numerous, generally closely appressed; wall agglutinated, simple; aperture single low arch at base of last chamber.

Locality : Manipur, Ukhrul District, Paoyi, Sangshak, West of Yentem.

Geological horizon : Pennsylvanian to Recent.

Family GLOBOROTALIIDAE

Genus *Globorotalia* Cushman

1926, *Globorotalia* Cushman, *Contrib. Cushman Lab. Foram. Res.*, 2(1) : 91.

55. *Globorotalia* sp.

Diagnosis : Test free, trochospiral, periphery carinate, chambers rhomboid or angular-conical, sutures generally thickened and elevated; wall calcareous, finely perforate, but with nonporous keel or peripheral band, surface smooth or hispid; aperture interiomarginal, an extraumbilical-umbilical arch bordered by lip, varying from narrow rim to broad spatulate.

Locality : Manipur, Ukhrul District, West of Mapum, Near Kamjong, SE of Shangshak, Yarshokha, Paoyi.

Geological horizon : Palaeocene to Recent.

Family BULIMINIDAE

Genus *Bulimina* d'Orbigny

1826. *Bulimina* d'Orbigny, *Ann. Sci. Nat. Paris*, (1) 7 : 269.

56. *Bulimina* sp.

Diagnosis : Test triserial in early stage, may tend to reduce to uniserial in later portion; wall calcareous, finely to coarsely perforate, radial in structure; aperture extending up from base of apertural face, with free border that may have elevated rim and fixed border attached to internal folded tooth plate, which with fixed shank is attached to internal chamber wall below aperture, with free shank that may be dentate or smooth, flaring or enrolled and subtubular.

Locality : Manipur, Ukhrul District, Ukhrul limestone, Yarshoka, West of Gamnom.

Geological horizon : Paleocene to Recent.

Family NONIONIDAE

Genus *Nonion* de Montfort

1808. *Nonion* de Montfort, *Conchyliologie systématique et classification méthodique des coquilles*, 1 : 210.

57. *Nonion* sp.

Diagnosis : Test free, planispiral and involute, slightly compressed, biumbonate, periphery rounded, peripheral outline lobulate; chambers numerous, increasing gradually in size as added; sutures distinct, depressed, radial, slightly curved; wall calcareous, finely perforate, granular in structure, surface smooth, umbonal region filled with secondarily deposited calcite, either as granules or solid boss; aperture an arched, equatorial, interiomarginal slit; filled umbilicus, thinner and more finely perforate and monolamellar walls.

Locality : Manipur, Ukhrul District, South of Chingai, West of Gamnom, nr. Sanka Lok, North of Shokpau, Ukhrul limestone.

Geological horizon : Paleocene to Recent.

Family NODOSARIIDAE

Genus *Dentalina* Risso

1826. *Dentalina* Risso, *Histoire naturelle des principales productions de l'Europe meridionale et particulièrement de celles des environs de Nice et des Alpes maritimes*. Paris, : 255.

58. *Dentalina* sp.

Diagnosis : Test elongate, arcuate, uniserial; sutures commonly oblique; aperture radiate, terminal, nearly central or eccentric; asymmetrical.

Locality : Manipur, Ukhrul District, South of Leiston.

Geological horizon : Permian to Recent.

Genus *Lagena* Walker & Jacob

1798. *Lagena* Walker & Jacob in Kanmacher, *Adam's Essays on the microscope*, London, : p. 634.

59. *Lagena* sp.

Diagnosis : Test unilocular, rarely two or more chambers; surface variously ornamented; aperture on elongate neck, with phialine lip, not radiate.

Locality : Manipur, Ukhrul District, Ukhrul, Shangshak, Phungyr-Lambui-Singkap Section, South of Leiston, nr. Molvailup Vill., nr. Sanka Lok, nr. Shokpau, North of Singkap, nr. Samkhong track.

Geological horizon : Jurassic to Recent.

Family CIBICIDIDAE

Genus *Cibicides* de Montfort

1808. *Cibicides* de Montfort, *Conchyliologie systématique et classification methodique des coquilles*, 1 : 122.

60. *Cibicides* sp.

Diagnosis : Test attached, plano-convex,

trochospiral, spiral side flat to excavated, evolute, umbilical side strongly convex, involute, apertural face sharply angled, distinct from umbilical side, periphery angular, with nonporous keel; wall calcareous, radial in microstructure, bilamellar, coarsely perforate on spiral side, large pores of earlier chambers generally closed by lamellar thickening of wall, finely perforate on umbilical side, apertural face nonporous, aperture a low interiomarginal opening with narrow lip, extend along spiral suture on spiral side.

Locality : Manipur, Ukhrul District, Ukhrul, South of Chingai, North of Singkap.

Geological horizon : Cretaceous to Recent.

Family HANTKENINIDAE

Genus *Globanolomalina* Haque

1956. *Globanolomalina* Haque, *Paleont. Pakistanica*, 1: 147.

61. *Globanolomalina* sp.

Diagnosis : Test free, planispiral to slightly asymmetrical, biumbilicate, chambers inflated, sutures curved and depressed; wall calcareous, finely perforate, radially built, and bilamellar, surface smooth; aperture an equatorial arch, with narrow lip, sometimes lip touching previous whorl at its periphery so as to form two lateral apertural openings.

Locality : Manipur, Ukhrul District, Yarshoka, West of Gamnom, West of Mapum, nr. Huimine, nr. Koshu, nr. Asu Lok, Tayengbi Jurel.

Geological horizon : Paleocene to Oligocene.

Genus *Hastigerina* Thomson

1876. *Hastigerina* Thomson in Murray, *Proc. R. Soc. London*, 24 : 534.

62. *Hastigerina* sp.

Diagnosis : Test free, early stage generally slightly trochospiral, adult planspiral, ranging from involute to loosely coiled, biumbilicate, periphery broadly rounded; chambers spherical to ovate; sutures deeply depressed, radial; wall finely to

coarsely perforate, radial in structure, surface smooth, hispid, or spinose; aperture interiomarginal, board, equatorial arch.

Locality : Manipur, Ukhrul District, Sangshak, and Phungyr-Lambui-Singkap section.

Geological horizon : Lower Miocene to Recent.

Remarks : Mishra (1991) recorded *Globigerinella* sp. from the olistostromal limestones of Ukhrul District; *Globigerinella* Cushman is a junior synonym of *Hastigerina* Thomson.

Family PLEUROSOTOMELLIDAE

Genus *Nodosarella* Rzehak

1895. *Nodosarella* Rzehak, *Annls. Naturist. Hofmuseum*, 10 : 219.

63. *Nodosarella* sp.

Diagnosis : Test free, uniserial; chambers inflated; sutures horizontal and constricted; wall calcareous; very finely perforate; aperture terminal, slit-like or faintly arcuate, bordered on each side by faint lip, or slightly overlapping hood on one side.

Locality : Manipur, Ukhrul District, nr. Kamjong; nr. Huimine, South west of Marao.

Geological horizon : Paleocene to Recent.

Family MILIOLIDAE

Genus *Quinqueloculina* d'Orbigny,

1826. *Quinqueloculina* d'Orbigny, *Ann. Sci. Nat. Paris*, (1) 7 : 301.

64. *Quinqueloculina* sp.

Diagnosis : Test free, chambers one-half coil in length, with longitudinal planes of successive chambers added 120° apart, test rounded to triangular in section; sutures distinct, depressed; wall calcareous, imperforate, smooth or faintly striate; aperture complex, varying in shape from triradiate in young to cruciform in matured form, bordered by narrow lip, without distinct teeth.

Locality : Manipur, Ukhrul District, Shangshak.

Geological horizon : Pliocene to Recent.

Family ALVEOLINIDAE

Genus *Borelis* de Montfort

1808. *Borelis* de Montfort, *Conchyliologie Systématique et classification méthodique des coquilles*, 1 : 170.

65. *Borelis* sp.

Diagnosis : Test minute, spheroidal to fusiform, with septula in continuous arrangement; in some tests, chamberlets of some chambers alternately large and small, with latter displaced towards exterior, septula therefore become y-shape; without post-septal passage, first whorls irregularly coiled.

Locality : Manipur, Ukhrul District, nr. Litan.

Geological horizon : Eocene to Recent.

Remarks : Mishra (1990) recorded *Alveolina* sp. from Upper Disang Formation in Ukhrul District; *Alveolina* is a junior synonym of *Borelis*.

Family ROTALIIDAE

Genus *Rotalia* Lamarck

1804. *Rotalia* Lamarck, *Annls. Mus. Nat. Hist. Nat.*, 5 : 183.

66. *Rotalia trochidiformis* Lamarck

1804. *Rotalia trochidiformis* Lamarck, *Annls. Mus. Nat. Hist. Nat.* 5 : 183.

Diagnosis : Test free, trochospiral, lenticular to plano-convex, about 1-4 mm. in diameter, all whorls visible from spiral side multilocular and single, direction of coiling random; chambers simple, 8-17 whorl; septa primarily double, formed by upward bending of chamber floor; wall calcareous, coarsely perforate, of radiating fibrous calcite; spiral side smooth, umbilical side with plug slit by anastomosing fissures into numerous tubercles and pillars that crowd central portion of test, pillars not continuous from one whorl to next but limited to each whorl, although they may fuse laterally to close fissures and form

solid central mass, with umbilical canal beneath cortical chamber layer receiving tributary canals from umbilical slit-like apertures at inner side of chambers.

Locality : Manipur : Ukhrul District, North of Yangphau, Shangshak, Phungyr-Lambui- Singkap Section.

Geological horizon : Mid Eocene.

Family ASTRORHIZIDAE

Genus *Bathysiphon* M. Sars

1872. *Bathysiphon* M. Sars in G.O. Sars, *Vidensk.-Selsk. Christiana, Forhandl.*, 1871 : 251.

67. *Bathysiphon* sp.

Diagnosis : Test free, large, to about 50mm. in length, elongate, narrow, more or less flexible tube, which may have annular constrictions; wall agglutinated, commonly of siliceous sponge spicules and fine sand or other mineral matter in calcareous cement; aperture at one open end; multinucleate protoplasm pseudopodia protruding only from one end of test where growth occurs, opposite end may be secondarily closed by secreted disc and contain intensely dark matters consisting of waste rejected by protoplasm and packed into arboreal end of test, additional discsecretedperiodicallyto seal of such debris, filled sections of test eventually becoming detached

Locality : Manipur, Ukhrul District, Shangshak, and Phungyr-Lambui-Singkap Section.

Geological horizon : Lower Cambrian to Recent.

Family LITUOLIDAE

Genus *Haplophragmoides* Cushman

1910. *Haplophragmoides* Cushman, *Proc. U.S. Natl. Mus.* 38(1) : 99.

68. *Haplophragmoides* sp.

Diagnosis : Test planispirally coiled, involute; wall agglutinated, aperture an equatorial interiomarginal slit; epidermal layer imperforate.

Locality : Manipur, Ukhrul District, nr. 26 km. Post (Ukhrul- Jessami Road).

Geological horizon : Carboniferous to Recent.

Class ACTINOPODA

Subclass RADIOLARIA

Order PORULOSIDA

Suborder SPUMELLINA

Family LIOSPHAERIDAE

Genus *Cenosphaera* Ehrenberg

69. *Cenosphaera* sp.

Diagnosis : Spherical latticed or spongy shells; without spines on shell surface; pores simple.

Locality : Manipur, Ukhrul District, Paoyi, Hundung, Lambui, Nangshong Khong Bridge, Gamnom, West of Mapum, South of Leiston, nr. Sanka Lok.

Geological horizon : Cambrian to Recent.

Family ELLIPSIDIIDAE

Genus *Ellipsidium* Haeckel

1887. *Ellipsidium* Haeckel, Report on the Radiolaria collected by H.M.S. Challenger during the year 1873-1876 : *Rept. Voyage Challenger, Zool.*, 18 : 1-1893 pp.

70. *Ellipsidium* sp.

Diagnosis : Elliptical latice shell; commonly articulated by annular transverse strictures; numerous radial spines; without polar tubules.

Locality : Manipur, Ukhrul District, North of Shingla.

Geological horizon : Devonian to Recent.

Genus *Lithapium* Haeckel

1887. *Lithapium* Haeckel, Report on the Radiolaria collected by H.M.S. Challenger during the year 1873-1876 : *Rept. Voyage Challenger, Zool.*, 18 : 1-1893 pp.

71. *Lithapium* sp.

Diagnosis : Elliptical or pear-shaped shell, single spine on one pole.

Locality : Manipur, Ukhrul District, Gamnom area.

Geological horizon : Cambrian to Recent.

Family DRUPPULIDAE

Genus *Druppula* Haeckel

1887. *Druppula* Haeckel, Report on the Radiolaria collected by H.M.S. Challenger during the year 1873-1876 : *Rept. Voyage Challenger, Zool.*, **18** : 1-1893 pp.

72. *Druppula* sp.

Diagnosis : Two elliptical latice shells; simple double shell without polar tubules or spines.

Locality : Manipur, Ukhrul District, East of Litan.

Geological horizon : Paleocene to Recent.

Family SPONGURIDAE

Genus *Spongoprimum* Haeckel

1887. *Spongoprimum* Haeckel, Report on the Radiolaria collected by H.M.S. Challenger during the year 1873-1876 : *Rept. Voyage Challenger, Zool.*, **18** : 1-1893 pp.

73. *Spongoprimum* sp.

Diagnosis : Spongy elliptical shell without equatorial strictures; solid shell without lattice mantle; two opposite polar spines.

Locality : Manipur, Ukhrul District, Hundung, Nangshong khong Bridge, west of Mapum, South of Leiston, nr. Maku Village.

Geological horizon : Ordovician to Recent.

Genus *Spongurus* Haeckel, 1862

74. *Spongurus* sp.

Diagnosis : Spongy cylindrical shell without equatorial strictures; solid spongy shell without polar spines or lattice-mantle.

Locality : Manipur, Ukhrul District, Paoyi,

South of Chingai, Towards Movailup, nr. Maku Village, nr. Huimine, nr. Awa khang Nala, East of Marao, nr. Tayungbi, Jurel, East of Jeishi, Yarshoka.

Geological horizon : Devonian to Recent.

Family CYPHANTIDAE

Genus *Ommatospyris* Ehrenberg, 1860

75. *Ommatospyris* sp.

Diagnosis : Elliptical shell with two equatorial strictures; double spherical or lenticular medullary shell.

Locality : Manipur, Ukhrul District, Paoyi, Yarshoka, Hundung, Shangshak, Fince Corner, West of Mapum, South of Leiston, nr. Kamjong, North of Nampisha, nr. Awakhang Nala.

Geological horizon : Eocene to Recent.

Family CENODISCIDAE

Genus *Cenodiscus* Haeckel

1887. *Cenodiscus* Haeckel, Report the Radiolaria collected by H.M.S. Challenger during the year 1873-1876 : *Rept. Voyage Challenger, Zool.* **18** : 1-1893 pp.

76. *Cenodiscus* sp.

Diagnosis : External lenticular latticed cortical shell; without medullary shell, chambered arms or equatorial girdle; margin without girdle or spines.

Locality : Manipur, Ukhrul District, Paoyi, Yarshoka, Hundung, Lambui, Shangshak, South of Chingai, Gamnom, Pusing, West of Mapum, Yarshoka, North of Shingla.

Geological horizon : Cambrian to Recent.

Family PHACODISCIDAE

Genus *Sethodiscinus* Haeckel

1887. *Sethodiscinus* Haeckel, Report on the Radiolaria collected by H.M.S. Challenger during the year 1873-1876 : *Rept. Voyage Challenger, Zool.*, **18** : 1-1893 pp.

77. *Sethodiscinus* sp.

Diagnosis : Single lenticular latticed cortical shell, simple medullary shell; neither girdle nor spines.

Locality : Manipur, Ukhrul District, Lambui.

Geological horizon : Eocene to Recent.

Genus *Periphaena* Ehrenberg, 1873

78. *Periphaena* sp.

Diagnosis : Single lenticular latticed cortical shell; simple medullary shell; without chambered equatorial girdles; margin with hyaline girdle.

Locality : Manipur, Ukhrul District, Lambui, nr. Awa khang.

Geological horizon : Cretaceous.

Genus *Triactis* Haeckel, 1882

79. *Triactis* sp.

Diagnosis : Single lenticular latticed cortical shell; without chambered equatorial girdles; three marginal spines; simple medullary shell.

Locality : Manipur, Ukhrul District, East of Marao, South East of Shangshak, East of Sakok, Phungyr-Lambui-Singkap Section

Geological horizon : Jurassic to Recent.

Family SPONGODISCIDAE

Genus *Spongodiscus* Ehrenberg, 1845

80. *Spongodiscus* sp.

Diagnosis : Simple central chamber surrounded by spongy framework, without porous sieve plate; circular disc without equatorial girdle.

Locality : Manipur, Ukhrul District, Gamnom; Chandel District, Moreh.

Geological horizon : Devonian to Recent.

Genus *Spongophacus* Haeckel, 1882

81. *Spongophacus* sp.

Diagnosis : Simple central chamber surrounded by spongy framework; spongy disc with solid or porous equatorial girdle.

Locality : Manipur, Ukhrul District, nr. Kamjong, northern slope of Peak 1613; Chandel District, Sugnu.

Geological horizon : Triassic to Recent.

Genus *Dictyocoryne* Ehrenberg, 1860

82. *Dictyocoryne* sp.

Diagnosis : Simple central chamber surrounded by spongy framework; spongy disc with three spongy radial arms; with patagium.

Locality : Manipur, Ukhrul District, East of Litan.

Geological horizon : Jurassic to Recent.

Order OCULOSIDA

Suborder NASSELLINA

Family ARCHIOCORYTHIDAE

Genus *Archiochorys* Haeckel, 1882

83. *Archiochorys* sp.

Diagnosis : Shell lacking joints or strictures; basal shell mouth open; ovate or urn-shaped shell with simple lattice; constricted mouth; with apical horn.

Locality : Manipur, Ukhrul District, Gamnom, Chandel District, Moreh.

Geological horizon : Cambrian to Recent.

Genus *Cornutana* Haeckel, 1882

84. *Cornutana* sp.

Diagnosis : Shell lacking joints or strictures; basal shell mouth open; conical shell with simple lattice; without apical horn.

Locality : Manipur, Chandel District, Moreh.

Geological horizon : Jurassic to Recent.

Genus *Cyrtocalpis* Haeckel, 1860

85. *Cyrtocalpis* sp.

Diagnosis : Shell lacking joints or strictures; basal shell mouth open; ovate shell with simple lattice; constricted mouth; without apical horn.

Locality : Manipur, Ukhrul District, Chingai, Gamnom.

Geological horizon : Cambrian to Recent.

Genus *Archicapsa* Haeckel, 1882

86. *Archicapsa* sp.

Diagnosis : Shell lacking joints or strictures; basal shell mouth fenestrated; without apical horn.

Locality : Manipur, Ukhrul District, Gamnom.

Geological horizon : Permian to Recent.

Family LOPHOPHAENIDAE

Genus *Sethocyrtis* Haeckel

1887. *Sethocyrtis* Haeckel, Report on the Radiolaria collected by H.M.S. Challenger during the year 1873-1876 : *Rept. Voyage Challenger, Zool.*, 18 : 1-1893 pp.

87. *Sethocyrtis* sp.

Diagnosis : Shell divided by transverse stricture into cephalis and thorax; without radial apophyses; thorax ovate; constricted mouth without collar; single apical horn.

Locality : Manipur, Ukhrul District, North of Shingla, Chandel District, Moreh.

Geological horizon : Jurassic to Recent.

Genus *Lithocampana* Clarke & Campbell

1942. *Lithocampana* Clarke & Campbell, *Geol. Soc. Am. Spl. Pap.* 39 : 1-112 pp.

88. *Lithocampana* sp.

Diagnosis : Shell divided by transverse stricture into cephalis and thorax; without radial apophyses; bell-shaped, without apical horn or lateral appendages.

Locality : Manipur, Ukhrul District, Phungyr-Lambui-Siangkap Section, North of Nampisha, North of Shokpau, East of Marao, South of Hundung Goda; Chandel District, Sugnu

Geological horizon : Eocene.

Genus *Adelocyrtis* Pantanelli, 1880

89. *Adelocyrtis* sp.

Diagnosis : Shell divided by transverse stricture into cephalis and thorax; without radial apophyses; basal shell mouth fenestrated; greatly inflated thorax; single apical horn.

Locality : Manipur, Ukhrul District, Hundung, Nangshong Khong Bridge.

Geological horizon : Cambrian to Recent.

Genus *Cryptocapsa* Haeckel, 1882

90. *Cryptocapsa* sp.

Diagnosis : Shell divided by transverse stricture into cephalis and thorax; without radial apophyses; basal shell mouth fenestrated; cephalis hidden within thorax; without apical horn.

Locality : Manipur, Ukhrul District, Yarshoka, Hundung, Shangshak, Nangshong Khong Bridge, West of Gamnom, Phungyr-Lambui-Singkap Section, East of Mapum, nr. Movailup Village.

Geological horizon : Jurassic to Recent.

Genus *Dicanthocapsa* Haeckel, 1882

91. *Dicanthocapsa* sp.

Diagnosis : Shell divided by transverse stricture into cephalis and thorax; without radial apophyses; basal shell mouth fenestrated; cephalis with two horns.

Locality : Manipur, Ukhrul District, West of Mapum, South of Leiston, nr. Maku Village.

Geological horizon : Cretaceous.

Family THEOCORYTHIDAE

Genus *Theocyrtis* Haeckel

1887. *Theocyrtis* Haeckel, Report on the Radiolaria collected by H.M.S. Challenger during the year 1873-1876 : *Rept. Voyage Challenger, Zool.*, 18 : 1-1893 pp.

92. *Theocyrtis* sp.

Diagnosis : Shell divided by two transverse strictures into cephalis, thorax and abdomen;

without basal apophyses; cylindrical abdomen; thorax and abdomen nearly equal width; with single apical horn.

Locality : Manipur, Chandel District, Moreh.

Geological horizon : Cretaceous to Recent.

Genus *Theocapsa* Haeckel, 1882

93. *Theocapsa* sp.

Diagnosis : Shell divided by two transverse strictures into cephalis, thorax and abdomen, without basal apophyses; basal shell mouth fenestrated; without latticed septum between thorax and abdomen; with single apical horn.

Locality : Manipur, Ukhrul District, Shangshak, Phungyr-Lambui-Sengkap Section, East of Mapum.

Geological horizon : Devonian to Recent.

Genus *Tricolocapsa* Haeckel

1887. *Tricolocapsa* Haeckel, Report on the Radiolaria collected by H.M.S. Challenger during the year 1873-1876 : *Rept. Voyage Challenger, Zool.* 18 : 1-1893 pp.

94. *Tricolocapsa* sp.

Diagnosis : Shell divided by two transverse strictures into cephalis, thorax and abdomen; without basal apophyses; basal shell mouth fenestrated; without latticed septum between thorax and abdomen; without apical horn.

Locality : Manipur, Ukhrul District, Paoyi, Yarshoka, Shangshak, Nangshong Khong Bridge, West of Gammom, nr. Maku Village, nr. Awakhang Nala, North Shingla, nr. Hundung.

Geological horizon : Jurassic to Recent.

Family ARTOPHORMIDIDAE

Genus *Kassina* Chabakov, 1937

95. *Kassina* sp.

Diagnosis : Shell divided by at least three strictures into cephalis, thorax, abdomen and post-abdominal segments; basal shell mouth

fenestrated; tower-shaped shell, with more than three chambers.

Locality : Manipur, Ukhrul District, Hundung, Lambui, Nangshong Khong Bridge, Gammom, Pusing, North of Nampisha, nr. Tayungbi Jurel, Northern slope of Nungu, Payoi-New Payoi

Geological horizon : Cretaceous.

Family STICHOCORYTHIDAE

Genus *Diplostrobos* Squinabol

1903. *Diplostrobos* Squinabol, *Riv. Ital. Paleontologica*, 9, fasc. 4, No. 3 : 105-150 pp.

96. *Diplostrobos* sp.

Diagnosis : Shell divided by at least three strictures into cephalis, thorax, abdomen and post-abdominal segments; with radial apophyses; basal shell mouth open; tubular post-abdomen with narrow mouth; five chambers from upper conical part of shell; with apical horn.

Locality : Manipur, Ukhrul District, nr. Awakhang Nala; Chandel District, Sugnu.

Geological horizon : Cretaceous.

Genus *Lithocampe* Ehrenberg, 1883

97. *Lithocampe* sp.

Diagnosis : Shell divided by at least three strictures into cephalis, thorax, abdomen and post-abdominal segments; with radial apophyses; basal shell mouth open; ovate or spindle-shaped shell; with constricted but not tubular mouth; cephalis without apical horn.

Locality : Manipur, Ukhrul District, Paoyi, Lambui, East of Pushing, South of Leiston, nr. Kamjong, nr. Lambui.

Geological horizon : Ordovician to Recent.

Genus *Lithomitra* Bütschli, 1882

98. *Lithomitra* sp.

Diagnosis : Shell divided by at least three strictures into cephalis, thorax, abdomen and post-

abdominal segments; with radical apophyses; basal shell mouth open; cylindrical shell; rounded cephalis without apical horn.

Locality : Manipur, Ukhrul District, Hundung, nr. Movailup Village, nr. Kamjong, nr. Huimine, Northern slope of Peak 1613, South East of Shangshak, Between Hundung and Lambui.

Geological horizon : Triassic to Recent.

Genus *Lithostrobus* Bütschli, 1882

99. *Lithostrobus* sp.

Diagnosis : Shell divided by at least three strictures into cephalis, thorax, abdomen and post-abdominal segments, with radial apophyses; basal shell mouth open; shell conical; with apical horn.

Locality : Manipur, Ukhrul District, Yarshoka, Hundung, Lambui, Shangshak, Nangshong Kongh Bridge, West of Mapum, nr. Awakhang Nala, East North-east of Sakok.

Geological horizon : Permian to Recent.

Genus *Stichocapsa* Haeckel, 1882

100. *Stichocapsa* sp.

Diagnosis : Shell divided by at least three strictures into cephalis, thorax, abdomen and post-abdominal segments; with radial apophyses; basal shell mouth fenestrated; last joint rounded but without basal spine or apical horn.

Locality : Manipur, Ukhrul District, Chingai, Gamnom.

Geological horizon : Devonian to Recent.

Family GLYCOBOTRYDIDAE

Genus *Glycobotrys* Campbell, 1951

101. *Glycobotrys* sp.

Diagnosis : Shell formed of cephalis and thorax; cephalis lobulated and has tubules; thorax fenestrated.

Locality : Manipur, Ukhrul District, nr. Nampisha, North of Shokpau, East North East of Shangla, Shangshak, Phungyr-Lambui-Singkap

Section.

Geological horizon : Eocene to Recent.

Family PYLOBOTRYDIDAE

Genus *Pylobotrys* Haeckel, 1882

102. *Pylobotrys* sp.

Diagnosis : Shell formed of cephalis, thorax and abdomen; basal shell mouth fenestrated; cephalis lobulated and devoid of cephalic tubules.

Locality : Manipur, Ukhrul District, Hundung.

Geological horizon : Eocene to Recent.

Genus *Botryocampe* Haeckel, 1882

103. *Botryocampe* sp.

Diagnosis : Shell formed of cephalis, thorax and abdomen; basal shell mouth fenestrated; cephalis lobulated and has cephalic tubules.

Locality : Manipur, Ukhrul District, South of Leiston, Toward Movailup, nr. Kamjong, North of Yangphau, South of Hundung Goda, East of Litan, Phungyr-Lambui-Singkap Section.

Geological horizon : Eocene to Recent.

Phylum COELENTERATA

Subphylum ANTHOZOA

Class ZOANTHARIA

Order SCLERACTINIA

Family MUSSIDAE

Genus *Circophyllia* Milne-Edwards & Haime,

1848. *Circophyllia* Milne-Edwards & Haime, *Annl. Sci. Nat.* (Paris), Ser. 3, 9 : 37-89.

104. *Circophyllia* sp.

Diagnosis : Solitary, turbinate or trochoid, fixed or free, colony formation by intratentacular budding; septothecate, costate; septa with one broad peripheral fan system and several smaller inner ones; columella well developed.

Locality : Manipur, Ukhrul District, South of Fumi.

Geological horizon : Eocene.

Family CARYOPHYLLIDAE

Genus *Oxysmilia* Duchassaing, 1870105. *Oxysmilia* sp.

Diagnosis : Solitary, colonial; colony formation by extratentacular budding; turbinate to subcylindrical, fixed or free; Pali opposite third cycle in one crown; Septothecate, with strong costae; columella fused in solid elongate mass.

Locality : Manipur, Churachandpur District, nr. Churachandpur.

Geological horizon : Late Cretaceous to Recent.

Genus *Trochocyathus* Milne-Edwards & Haime

1848. *Trochocyathus* Milne-Edwards & Haime, *Annls. Sci. Nat.* (Paris) Ser. 3, 9: 37-89.

106. *Trochocyathus* sp.

Diagnosis : Solitary, turbinate to ceratoid fixed or free; pali opposite all but last cycle in two crowns; columella fascicular, spongy or crispate.

Locality : Manipur, Chandel District, nr. Sugnu; Ukhrul District, nr. Litan.

Geological horizon : Middle Jurassic to Recent.

Genus *Tethocyathus* Kühn

1933. *Tethocyathus* Kühn, *Palaeontographica* 79, A: 143-218.

107. *Tethocyathus* sp.

Diagnosis : Solitary, turbinate to ceratoid, fixed or free; pali opposite all but last cycle in two crowns; columella fascicular; edge zone narrow; epitheca extensive; spongy or crispate.

Locality : Manipur, Chandel District, nr. Sugnu; Churachandpur District, nr. Churachandpur; Ukhrul District, South of Lower Phaibung.

Geological horizon : Eocene to Recent.

Phylum BRYOZOA

Subphylum ENTOPROCTA

Class GYMNOLAEMATA

Order CHEILOSTOMATA

Family HINCKSINIDAE

Genus *Hincksina* Norman, 1903108. *Hincksina* sp.

Diagnosis : Zoaria generally incrusting, with

endozooecial ovicells; membranous area entire, mural rim with numerous spines, ovicell small; avicularia interzooecial.

Locality : Manipur – Nagaland Ophioite belt.

Geological horizon : Eocene to Recent.

Genus *Aplousina* Canu & Bassler

1987. *Aplousina* Canu & Bassler, *Seineet-Oise Soc. Bull.* t. 8, suppl., 1-32 pp.

109. *Aplousina* sp.

Diagnosis : Simple incrusting zooecia with small but prominent ovicells; no spines.

Locality : Manipur-Nagaland Ophioite belt.

Geological horizon : Cretaceous to Recent.

Family CALLOPORIDAE

Genus *Alderina* Norman, 1903110. *Alderina* sp.

Diagnosis: Incrusting, with zooecia generally bearing small gymnocyst, cryptocyst confined to descending part; membranous front with crenulated walls; no lateral spines or avicularia; dietellae present; hypostomal ovicell, with rib or depressed area.

Locality : Manipur-Nagaland Ophiolite belt.

Geological horizon : Cretaceous to Recent.

Phylum ARTHROPODA

Class CRUSTACEA

Order PODOCAPIDA

Family BAIRDIIDAE

Genus *Bairdia* McCoy

1844. *Bairdia* McCoy, *A synopsis of the characters of the Carboniferous limestone fossils of Ireland*. Dublin, 207 pp.

111. *Bairdia* sp.

Diagnosis : Carapace often elongate fusiform in lateral view, with broadly arched dorsum that

becomes concave terminally. Venter centrally straight but curved upward terminally so that extremities are nearly at mid-height, anterior end generally higher and better rounded than the posterior, which generally is acuminate. LV larger than RV, mostly overreaching it around entire margin and overlapping it. Contact margin complex with wide duplicature, vestibule and associated structures.

Locality : Manipur, Ukhrul District, Limestone blocks of Ukhrul, Hundung, Lambui and Chingai.

Geological horizon : Ordovician to Recent.

Family LEGUMINOCYTHERIDAE

Genus *Leguminocythereis* Howe

1936. *Leguminocythereis* Howe, *Louisiana Geol. Surv. Geol. Bull.* No. 7 : 96.

112. *Leguminocythereis* sp.

Diagnosis : Carapace bean shaped, with dorsum and venter subparallel, ends rounded, anterior broadest, greatest thickness behind middle; surface reticulate, with vertical element in upper half. Hinge holamphidont, with sharp anterior tooth in right valve behind which is a triangular socket, furrow, and oblique rounded posterior tooth, marginal areas regular, with small anterior vestibule; adductor muscle scars a vertical row of 4, with two antennal scars in front of lower pair and two small ovate mandibular scars just above ventral inner margin; normal canals large; widely spaced.

Locality : Manipur, Ukhrul District, Limestone blocks of Ukhrul, Hundung, Lambui and Chingai.

Geological horizon : Eocene to Miocene.

Genus *Acuticythereis* Edwards, 1944.

113. *Acuticythereis* sp.

Diagnosis : Carapace elongate ovate, short, right valve tending to be subangulate posteriorly. Surface smooth or finely reticulate. Hinge holamphidont, with prominent pyramidal anterior tooth in right valve, behind which triangular

socket is less elongate; adductor scars a vertical row of 4, with two rounded antennal scars in front and 2 rounded mandibular scars just above ventral inner margin; normal canals rather large and moderately scattered.

Locality : Manipur : Ukhrul District, Limestone blocks of Ukhrul, Hundung, Lambui and Chingai

Geological horizon : Miocene.

Order DECAPODA

Suborder PLEOCYEMATA

Infraorder BRACHYURA

Superfamily PORTUNOIDEA

Family PORTUNIDAE

Genus *Portunus* Weber, 1795

114. *Portunus* sp.

Diagnosis : Carapace broad, front with 3-6 teeth, antero-lateral margin mostly with 9 teeth, basal antennal segment very short, Chelipeds with dentate merus, carpus and propodus and costate palms; all segments of 5th pereopods flattened.

Locality : Manipur, Bishenpur District, nr. Limatak.

Geological horizon : Eocene to Miocene.

Remarks : Mishra (1991) recorded *Portunus* sp. and *Neptunus* sp. from the Upper Disang Formation near Limatak; *Neptunus* is regarded as a junior synonym of *Portunus*.

Superfamily XANTHOIDEA

Family GONEPLACIDAE

Genus *Galenopsis* Milne-Edwards

1865. *Galenopsis* Milne-Edwards, *Ann. Sci. Nat., Zoologie* (5) 3 : 297-351.

115. *Galenopsis* sp.

Diagnosis : Carapace transversely oval, smooth, moderately convex, front deflexed,

medially sulcate, orbits small; antero-lateral margins curved, short, with weak teeth; postero-lateral margin long, straight, posterior margin long; branchial regions inflated.

Locality : Manipur, Ukhrul District, New Haven-Ukhrul Road Section of Litan-New Ukhrul Road.

Geological horizon : Eocene to Oligocene.

Remarks : Khan *et al.* (1988) reported this species from the siltstones of the Upper Disang Formation.

Phylum MOLLUSCA

Class BIVALVIA

Subclass PALAEOTAXODONTA

Order NUCULOIDA

Family NUCULIDAE

Genus *Nucula* Lamarck

1799. *Nucula* Lamarck, *Mem. Soc. Hist. Nat. Paris*, 1 : 87.

116. *Nucula* (*Nucula*) sp.

Diagnosis : Shell material nacreous; truncate posterior extremity, pallial sinus absent; beaks ophistogyrate; restilifer present; sculpture of radial ribs, inner ventral margin crenate.

Locality : Manipur, Bishenpur District, nr. Limatak; Ukhrul District, North of New Paoyi, Tulloi.

Geological horizon : Upper Cretaceous to Recent.

Family NUCULANIDAE

Genus *Nuculana* Link

1807. *Nuculana* Link, *Beschreibung der Naturalien-Sammlung der Univesität zu Rostok*, : 155 p.

117. *Nuculana* sp.

Diagnosis : Shell elongate posteriorly, small,

corbuloid, strongly inflated, rostrum blunt; pallial sinus present, shallow, restilifer present; ligament partially internal, ligament pit narrow, oblique, posterior end produced; with concentric sculpture.

Locality : Manipur : Ukhrul District, nr. Litan, South of New Paoyi.

Geological horizon : Triassic to Recent.

Subclass PTERIOMORPHA

Order ARCOIDA

Family ARCIDAE

Genus *Barbatia* Gray

1842. *Barbatia* Gray, *Synop. Conch. Brit. Mus.*, 44 : 81.

118. *Barbatia* sp.

Diagnosis : Small, elongate, ovoid, inequilateral, equivalve; umbonal carina low, rounded, cardinal area low; terminations rounded or subangular and slightly expanded; ligamental grooves closely spaced; ornamentation costellate, commonly fine.

Locality : Manipur: Chandel District, nr. Sugnu; Ukhrul District, nr. Sundal.

Geological horizon : Jurassic to Recent.

Family GLYCYMERIDIDAE

Genus *Glycymeris* da Costa

1778. *Glycymeris* da Costa, *Brit. Conch.*, 1778 : 168.

119. *Glycymeris* sp.

Diagnosis : Subcircular, subequilateral, with small umbones and beaks; teeth relatively short, transverse, becoming obsolescent medially; surface smooth or costate, ventral margins internally fluted.

Locality : Manipur : Churachandpur District, nr. Churachandpur (Upper Disang Formation); Ukhrul District, West of Nungbi, South of Fumi.

Geological horizon : Lower Cretaceous to Recent.

Order MYTILOIDA

Family MYTILIDAE

Genus *Brachiodontes* Swainson

1840. *Brachiodontes* Swainson, *A Treatise on malacology or shells and shell-fish*. The Cabinet Cyclopedia, Nat. Hist. : 384.

120. *Brachiodontes* sp.

Diagnosis : Equivalve, inequilateral, typically mytiliform; anterior beaks terminal or nearly so; anterior margin twisted, with interlocking folds, radially sculptured with bifurcating ribs, ligament relatively short, hinge with dysodont teeth before and after ligament.

Locality : Manipur, Ukhrul District, North of New Paoyi

Geological horizon : Jurassic to Recent.

Genus *Mytilus* Linnaeus

1758. *Mytilus* Linnaeus, *Syst. Nat. ed.*, 10 : 704.

121. *Mytilus* sp.

Diagnosis : Shell wedge-shaped, elongate, beaks terminal, lunule with radiating folds forming dysodont teeth on anterior margin, anterior retractor scar elongate, behind umbo; anterior adductor small but distinct; margins not crenulated, surface smooth or with radial ribs which are not bent dorsalward.

Locality : Manipur, Ukhrul District, nr. Ukhrul (Upper Disang rocks).

Geological horizon : Upper Jurassic to Recent.

Remarks : Presence of *Mytilus* sp. in the Upper Disang rocks of Manipur is recorded for the first time.

Family PINNIDAE

Genus *Pinna* Linnaeus

1758. *Pinna*, Linnaeus, *Syst. Nat. ed.*, 10 : 707.

122. *Pinna* sp.

Diagnosis : Equivalve, wedge-shaped, ventral

margin straight to concave; umbones at extreme anterior end; valves carinate medially, median ridge well defined; sculpture of radial ribs or rows of scales.

Locality : Manipur, Ukhrul District, nr. Chingai, nr. Sundal.

Geological horizon : Carboniferous to Recent.

Order PTERIOIDA

Family PECTINIDAE

Genus *Euberneopecten* Conrad

1865. *Euberneopecten*, Conrad, *Am. J. Conchol.*, 1 : 137-141.

123. *Euberneopecten* sp.

Diagnosis : Small, thin; valves not gaping, nearly smooth except for minute radial striae, often with fine concentric grooves; anterior auricle larger, with radial sculpture; hinge with cardinal crura, auricular crura present or absent; interior without radial riblets.

Locality : Manipur, Chandel District, nr. Sugnu.

Geological horizon : Upper Cretaceous to Oligocene.

Genus *Chlamys* Roeding

1798. *Chlamys* Roeding, *Mus. Bollen.*, 1798 : 161.

124. *Chlamys* (*Chlamys*) sp.

Diagnosis : Higher than long; auricles clearly delimited, anterior auricle longer than posterior one; byssal notch large; ctenolium present; sculpture of numerous, generally grooved or striated and spinose, radial ribs; inner margin with rounded, grooved, weak riblets; cardinal crurae weak or indistinguishable.

Locality : Manipur, Ukhrul District, Chingai.

Geological horizon : Triassic to Recent.

125. *Chlamys* (*Aequipecten*) sp.

Diagnosis : Differs from *Chlamys* (*Chlamys*) in more rounded outline, nearly equal auricles, smaller byssal notch, fewer, usually not bifurcating

radial ribs, and flattened, marginally pointed internal riblets near margin; pair of cardinal crura and auricular denticles.

Locality : Manipur, Ukhrul District, West of Nungbi, South of New Paoyi.

Geological horizon : Cretaceous to Recent.

Genus *Pecten* Müller, 1776

126. *Pecten* (*Pecten*) sp.

Diagnosis : Right valve clearly convex, left valve gently convex or nearly flat; auricles nearly equal; radial ribs well developed, generally flat-topped radially striated, grooved; hinge with cardinal crura extending from each side of ligament pit.

Locality : Manipur, Ukhrul District, nr. Chingai, West of Nungbi.

Geological horizon : Eocene to Recent.

Family SPONDYLIDAE

Genus *Spondylus* Linnaeus

1758. *Spondylus* Linnaeus, *Syst. Nat. ed.*, 10 : 700.

127. *Spondylus* (*Spondylus*) sp.

Diagnosis : Orbicular or oval, gibbous, inequivalve, right valve more convex; well inflated, mostly with strong radial sculpture; cardinal area of right valve large, triangular; crural teeth short, heavy, smooth or with weakly crenulated edges; ligament alivincular, resilium deeply sunk in triangular pit.

Locality : Manipur, Ukhrul District, Chingai.

Geological horizon : Jurassic to Recent.

Subclass PALAEOHETERODONTA

Order UNIONOIDA

Family UNIONIDAE

Genus *Potomida* Swainson

1840. *Potomida* Swainson, *A Treatise on malacology or shells and shell-fish*. The Cabinet Cyclopaedia, Nat. Hist.

128. *Potomida* sp.

Diagnosis : Rounded rhomboid, moderately heavy, subinflated, round and short in front, wide and roundly truncate behind; beaks high, full with numerous, fine subparallel wavy ridges which may extend over disc as rows of knobs or nodules; cardinals moderately massive, lamellar teeth commonly curved slightly; beak cavity rather deep.

Locality : Manipur, Churachandpur District, nr. Churachandpur; Ukhrul District, South of Fumi.

Geological horizon : Oligocene to Recent.

Order TRIGONIOIDA

Family TRIGONIIDAE

Genus *Trigonia* Bruguière, 1789

129. *Trigonia* sp.

Diagnosis : Trigonal, umbones prominent; marginal carina prominent, serrated, escutcheon carina obtuse; area wide, bipartite, radially costate; flank with continuous concentric costae, ends of costae commonly separated from marginal carinae in left valve or in both valves by smooth radial space.

Locality : Manipur, Ukhrul District, nr. Chingai.

Geological horizon : Mid-Triassic to Upper Cretaceous.

Subclass HETERODONTA

Order VENEROIDA

Family LUCINIDAE

Genus *Lucina* Bruguière

1797. *Lucina* Bruguière, *Encyl. Meth.*, 2 : pl. 284.

130. *Lucina* sp.

Diagnosis : Subtrapezoidal, more or less flattened, with well marked dorsal areas; sculpture of somewhat evenly spaced concentric lamellae, stronger posteriorly; dorsal areas clearly marked, lunule asymmetrical, elongate, narrow. Cardinals

two, oblique, somewhat weakened; anterior scars elongate, distant from pallial line; inner shell margin feebly crenulate.

Locality : Manipur, Ukhrul District, Chingai.

Geological horizon : Upper Cretaceous to Recent.

Family UNGULINIDAE

Genus *Diplodonta* Bronn

1831. *Diplodonta* Bronn, *Ergeb. Nat. Reisen*, **22** : 484.

131. *Diplodonta* sp.

Diagnosis : Suborbicular, convex, inequilateral, beaks prosogyrous; ligament on medium-sized flattened nymph with narrow resilium on its anterior extremity; hinge with two well developed oblique cardinals in each valve, with somewhat narrow short teeth; anterior muscles scars sinuate, narrower than posterior scars.

Locality : Manipur, Ukhrul District, West of Nungbi.

Geological horizon : Paleocene to Recent.

Remarks : Mitra *et al.* (1986) recorded *Taras* sp. from West of Nungbi in Ukhrul District; *Taras* Risso is regarded as a junior synonym of *Diplodonta*.

Family CARDITIDAE

Genus *Cardiocardita* Anton, 1839

132. *Cardiocardita* sp.

Diagnosis : Inequilateral, subtrapezoidal, rounded in front, obliquely truncate at rear; with strong nodular ribs, ribs generally well spaced and sharply defined; lunule slightly depressed; beaks low. Hinge with trihedral cardinals; anterior laterals minute.

Locality : Manipur, Chandel District, nr. Sugnu; Ukhrul District, Tulloi, North of Paoyi, South of New Paoyi, West of Nungbi.

Geological horizon : Eocene to Recent.

Family CARDIIDAE

Genus *Cardium* Linnaeus

1758. *Cardium* Linnaeus, *Syst. Nat. ed.*, **10** : 678.

133. *Cardium* sp.

Diagnosis: Semicircular; rib ornamentation along rib crests, ribs keeled; posterior margin crenulate; hinge nearly straight; relatively long, posterior cardinal in left valve elevated.

Locality : Manipur, Ukhrul District, nr. Chingai.

Geological horizon : Upper Triassic to Recent.

Genus *Loxocardium* Cossmann, 1886

134. *Loxocardium* sp.

Diagnosis : Nearly equilateral, posterior margin slightly truncate; posterior ribs notched; rib sculpture of fine looped cross-threads or A-shaped nodes; hinge relatively short.

Locality : Manipur, Churachandpur District, nr. Churachandpur; Ukhrul District, nr. Litan, Tulloi, South of Fumi.

Geological horizon : Eocene to Miocene.

Genus *Vepricardium* Iredale

1929. *Vepricardium* Iredale, Mollusca from the Continental shelf of eastern Australia, Part-2; *Australian Museum Records*, **17** : 157-189.

135. *Vepricardium* sp.

Diagnosis : Semicircular in outline, posterior ribs not digitate; dorsal margins with smooth areas; ribs interspace linear.

Locality : Manipur, Chandel District, nr. Sugnu.

Geological horizon : Upper Cretaceous to Recent.

Genus *Trachycardium* Moersch

1853. *Trachycardium* Moersch, *Cat. Conch. Yoldi* (2) : 34.

136. *Trachycardium* sp.

Diagnosis : Ovate but not oblique, rib ornamentation of imbricating scales along

posterior sides of ribs; hinge relatively short, heavy, nearly straight; cardinal teeth unequal in size.

Locality : Manipur, Ukhrul District, South of New Paoyi.

Geological horizon : Oligocene to Recent.

Family TELLINIDAE

Genus *Tellina* Linnaeus

1758. *Tellina* Linnaeus, *Syst. Nat. ed.*, 10 : 674.

137. *Tellina* sp.

Diagnosis : Shell elongate, ligament internal, valves more or less unequal, cardinal hinge teeth either in two valves.

Locality : Manipur, Ukhrul District, Chingai.

Geological horizon : Cretaceous to Recent.

Family PSAMMOBIIDAE

Genus *Gari* Schummacher

1817. *Gari* Schummacher, *Essai Nouv. Syst. Vers. Test.* : p. 44, 131.

138. *Gari* (*Garum*) sp.

Diagnosis : Elongate-ovate, posterior end wider than anterior; sculpture of fine concentric grooves; pallial sinus short.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Eocene.

Family ARCTICIDAE

Genus *Arctica* Schumacher

1817. *Arctica* Schumacher, *Essai Nouv. Syst. Vers. Test.*, 287 pp.

139. *Arctica* sp.

Diagnosis : Equivalve, inequilateral, closed, solid, smooth, ovate, periostracum well developed; no lunule or escutcheon; valve margin almost smooth; adductor muscle scars subequal.

Locality : Manipur, Bishenpur District, nr. Limatak; Ukhrul District, Tulloi; Chandel District, nr. Sugnu.

Geological horizon : Lower Cretaceous to Recent.

Family KELLIELLIDAE

Genus *Allopagus* Stoliczka

1871. *Allopagus* Stoliczka, *Paleont. Indica* (6), 3 : 537 pp.

140. *Allopagus* sp.

Diagnosis : Small, equivalve, suborbicular or ovate, inequilateral, tumid, beaks small; hinge of right valve with one cardinal in front of beak, left valve with one cardinal in front of beak; pallial line entire.

Locality : Manipur, Ukhrul District, West of Nungbi.

Geological horizon : Mid-Eocene.

Family GLOSSIDAE

Genus *Glossus* Poli, 1795

141. *Glossus* (*Cytherocardia*) sp.

Diagnosis : Cordiform, not gaping, beaks less twisted, hinge thin, with two lamellar cardinals in either valve; no lunular groove; ligament and resilium in deep groove; adductor scars equal; internal margin smooth; pallial line entire.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Eocene to Miocene.

Family CORBICULIDAE

Genus *Corbicula* Mergele von Mühlfeld, 1811

142. *Corbicula* sp.

Diagnosis : Shell material dense, rounded-trigonal, with well developed periostracum; concentric sculpture present; hinge with posterior and anterior lateral teeth, lateral teeth serrate.

Locality : Manipur, Ukhrul District, nr. Sundal, South of New Paoyi.

Geological horizon : Lower Cretaceous to Recent.

Family VENERIDAE

Genus *Pitar* Römer, 1857143. *Pitar* sp.

Diagnosis : Shell inequilateral, subtrigonal, smooth or finely striate, pallial sinus deep and pointed; beaks anterior; cardinal teeth not tending to radiate, anterior laterals well developed, lunule superficial, escutcheon not distinct.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Eocene to Recent.

Genus *Mercenaria* Schummacher

1817. *Mercenaria* Schummacher, *Essai Nouv. Syst. Vers. Test.*, 287 pp.

Diagnosis : Form cordate, inequilateral, sculpture concentric, but radial sculpture nearly obsolete; lunule and escutcheon well defined; ligamental nymphs rugose.

Locality : Manipur, Churachandpur District, nr. Churachandpur; Ukhrul District, South of Fumi.

Geological horizon : Oligocene to Recent.

Order MYOIDA

Family CORBULIDAE

Genus *Corbula* Bruguière

1797. *Corbula* Bruguière, *Encyl. Meth.*, 2 : pl. 230.

144. *Corbula* sp.

Diagnosis : Shells sturdy, valves inequilateral, left valve slightly smaller than right valve, without projecting chondrophore, moderately inflated, concentrically ribbed; posterior end somewhat rostrate.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Cretaceous to Recent.

Genus *Caestocorbula* Vincent, 1910145. *Caestocorbula* (*Parmicorbula*) sp.

Diagnosis : Shell valves discrepant in shape,

left valve more equilateral and less rostrate than right valve; siphonal plate small, rectangular, with faint median groove; pallial sinus well developed, broad and round.

Locality : Manipur, Ukhrul District, Tulloi, nr. Litan; Churachandpur District, nr. Churachandpur.

Geological horizon : Upper Cretaceous to Eocene.

Family PHOLADIDAE

Genus *Scobinopholas* Grant & Gayle

1931. *Scobinopholas* Grant & Gayle, *San Diego Soc. Nat. Hist. Mem.*, 1 : 431.

146. *Scobinopholas* sp.

Diagnosis : Shell rounded anteriorly with slitlike pedal gape.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Miocene to Recent.

Remarks : Mitra *et al.* (1986) recorded *Scobina* sp. from the Olistostromal deposits of Manipur; *Scobina* Bayle is now regarded as a synonym of *Scobinopholas*.

Family HIATELLIDAE

Genus *Panopea* Menard, 1807147. *Panopea* sp.

Diagnosis : Shells somewhat rectangular, moderately large, gaping, beaks subcentral; ligamental nymph large, high; pallial sinus wide.

Locality : Manipur-Nagaland Ophiolite belt.

Geological horizon : Triassic to Recent.

Order HIPPURITOIDA

Family MONOPLEURIDAE

Genus *Paramonopleura* Korobkov, 1967148. *Paramonopleura* sp.

Diagnosis : Shell small, inequivalve; right valve attached and exogyroid, with cuneiform

tooth, 1' circular, 3' divided by low ridge; left valve free, with two unequal teeth, operculiform, tooth 1 high and curved, tooth 3 marginal, biapical, socket deep.

Locality : Manipur, Ukhrul District, South of Fumi.

Geological horizon : Paleocene.

Subclass ANOMALODESMATA

Order PHOLADOMYOIDA

Family CUSPIDARIIDAE

Genus *Cuspidaria* Nardo

1840. *Cuspidaria* Nardo, *Atti. Riun. Sci. Ital.*, 1 (1839) : 202.

149. *Cuspidaria* sp.

Diagnosis : Shell ovate, posterior end of shell strongly rostrate, inequivalve, left valve more convex, hinge with resilifer and one or more teeth.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Upper Cretaceous to Recent.

Order MYTILOIDA

Suborder OSTREINA

Family OSTREIDAE

Genus *Ostrea* Linnaeus

1758. *Ostrea* Linnaeus, *Syst. Nat.* ed. 10 : 696.

150. *Ostrea* sp.

Diagnosis : Shells moderate to large sized, variable outline but often roughly orbicular with hardly prominent umbones pointed and flanked by small to large auricles, posterior auricle larger than anterior one; width about one-fourth of height. Right valve flat or gently convex, covered by many fragile flattish conchiolinous growth squamae, peripheral conchiolin fringe extensive, calcareous part of right valve much smaller than corresponding left valve. Concentric undulations

distinct or indistinct. Left valve slightly convex, covered by many long unequal, rounded radial ribs interrupted by free-standing frilled delicate growth squamae less abundant than those on right valve; some concentric undulations present. No hyote spines on radial ribs. Ligamental areas longer than high. Chomata present. Adductor muscle imprint reniform, both ends rounded with length about four times of height, more centrally located. Left valve without umbonal cavity.

Locality : Manipur, Chandel District, nr. Sugnu; Ukhrul District, Chingai, Sundal, South of New Paoyi.

Geological horizon : Cretaceous to Recent.

Class GASTROPODA

Subclass PROSOBRANCHIA

Order ARCHAEOGASTROPODA

Family TROCHIDAE

Genus *Margarites* Gray, 1847

151. *Margarites* sp.

Diagnosis : Small, thin shells; turbiniform; peristome interrupted and columellar and outer lips unthickened; outer lip not strongly prosocline; spire low, whorls nearly smooth, last whorl large; macre conspicuous.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Upper Cretaceous to Recent.

Genus *Solariella* Wood, 1842

152. *Solariella* sp.

Diagnosis : Shell conical with open umbilicus; aperture more or less circular; last whorl rounded.

Locality : Manipur, Churachandpur District, nr. Churachandpur; Ukhrul District, Tulloi.

Geological horizon : Miocene to Recent.

Family TURBINIDAE

Genus *Collonia* Gray, 1850153. *Collonia* sp.

Diagnosis : Strong solid shell, few-whorled, globose, operculum paucispiral, with a central pit nearly smooth, inflated, umbilicate; outer lip thickened, peristome generally entire.

Locality : Manipur, Churachandpur District, nr. Churachandpur.

Geological horizon : Upper Cretaceous to Recent.

Suborder NERITOPSINA

Family NERITIDAE

Genus *Nerita* Linnaeus1758. *Nerita* Linnaeus, *Syst. Nat.* ed. 10 : 776.154. *Nerita* sp.

Diagnosis : Sturdy shells, globose; no umbilicus; smooth to spirally ribbed; inner lip septum well developed, its surface pustulose or irregular ribbed.

Locality : Manipur-Nagaland Ophiolite belt.

Geological horizon : Upper Cretaceous to Recent.

Family PATELLIDAE

Genus *Helcion* Montfort

1810. *Helcion* Montfort, *Conchyliologie Systematique et Classification Methodiques des Coquilles*, 2 : 62, 63.

155. *Helcion* sp.

Diagnosis : Shell cap-shaped, high arched, with the incurved apex almost at the anterior end; sculpture consists of radial scaly ribs.

Locality : Manipur, Ukhrul District, nr. Ukhrul (Upper Disang rock.)

Geological horizon : Cretaceous to Recent.

Remarks : *Helcion* sp. is recorded first time from the Disang Series in Manipur.

Order MESOGASTROPODA

Family LITTORINIDAE

Genus *Littorina* Ferussac1822. *Littorina* Ferussac, *Tab. Syst. Anim. Moll.*, : 34.156. *Littorina* sp.

Diagnosis : Shell large, sculptured with spiral striae; spire more than half the length of body whorl.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Cretaceous to Recent.

Family EPITONIDAE

Genus *Cirsotrema* Mörch1852. *Cirsotrema* Mörch, *Cat. Conch.* 1.157. *Cirsotrema* sp.

Diagnosis : With thickened varices and spiral ribs; basal disc well marked.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Cretaceous to Recent.

Family TURRITELLIDAE

Genus *Turritella* Lamarck1799. *Turritella* Lamarck, *Mem. Soc. Hist. Nat. Paris* : p. 74.158. *Turritella* sp.

Diagnosis : Shell high-spired, with number of whorls; whorls convex, spiral ornament conspicuous, neanic spirals starting in the order abapical-medial-apical; outer lip arcuate, lateral sinus shallow, oblique; no basal sinus.

Locality : Manipur, Churachandpur, nr. Churachandpur; Chandel District, nr. Sugnu; Ukhrul District, Chingai, nr. Sundal, nr. Ukhrul (Upper Disang rocks).

Geological horizon : Oligocene to Recent.

Family CERITHIIDAE

Genus *Cerithium* Bruguière, 1789159. *Cerithium* sp.

Diagnosis : Shell small to moderately large, narrowly elongate and turreted with many whorls, heavy, sculptured with swollen nodules and spiral threads which become prominently nodulose towards base, aperture ovate and often lirate.

Locality : Manipur; Ukhrul District, nr. Jessami

Geological horizon : Cretaceous to Recent.

Remarks : *Cerithium* sp. is recorded first time from the Disang Series in Manipur.

Family NATICIDAE

Genus *Natica* Scopoli1777. *Natica* Scopoli, *Introd. Hist. Nat.* : 392.160. *Natica* sp.

Diagnosis: Shell thick, solid, rounded; faint radial striae below suture; operculum calcareous.

Locality : Manipur, Chandel District, nr. Sugnu.

Geological horizon : Cretaceous to Recent.

Family FICIDAE

Genus *Ficus* Roeding1798. *Ficus* Roeding, *Mus. Bolten.* : 148.161. *Ficus* sp.

Diagnosis : Spire high, canal short, axial and spiral cords present.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Cretaceous to Recent.

Order NEOGASTROPODA

Superfamily MURICOIDAE

Family BUCCINIDAE

Genus *Neptunea* Roeding, 17981798. *Neptunea* Roeding, *Mus. Bolten.*, 2 : 148.162. *Neptunea* sp.

Diagnosis : Shell fusiform, ventricolous, anterior convex, spire elevated, aperture ovate, anterior canal broad, columella simple.

Locality : Manipur, Ukhrul District, nr. Ukhrul (Upper Disang rock).

Geological horizon : Cretaceous to Recent.

Remarks : *Neptunea* sp. is recorded first time from the Disang Series in Manipur.

Family FASCIOLARIIDAE

Genus *Mazzalina* Conrad1860. *Mazzalina* Conrad, *J. Acad. Nat. Sci. Philad.* 4(3) : 295.163. *Mazzalina* sp.

Diagnosis : Shell pyriform, globulose, smooth, columella bearing several folds at its base; canal arched.

Locality : Manipur, Churachandpur District, nr. Churachandpur

Geological horizon : Cretaceous to Recent.

Subclass HETEROBRANCHIA

Superorder ALLOGASTROPODA

Family ARCHITECTONICIDAE

Genus *Architectonica* Roeding1798. *Architectonica* Roeding, *Mus. Bolten.* 2 : 78.164. *Architectonica* sp.

Diagnosis : Spire gently convex, sutures hardly apparent; umbilicus bounded by a beaded ridge and the operculum flat; few whorled, horny.

Locality : Manipur, Chandel District, nr. Sugnu.

Geological horizon : Cretaceous to Recent.

Order OPHISTHOBRANCHIA

Suborder NUDIBRANCHIA

Family DORIDIDAE

Genus *Cadlina* Bengli, 1878165. *Cadlina* sp.

Diagnosis : Body elliptical, more or less

flattened, dorsal plates large covering the head and width of foot of the body, buccal tentacles less developed;

Locality : Manipur, Ukhrul District, South of Fumi.

Geological horizon : Cretaceous to Recent.

Remarks : Mitra *et al.* (1986) recorded *Ectinochila* sp. from South of Fumi which is at present regarded as a synonym of *Cadlina*.

Class CEPHALOPODA

Superfamily BOLITAENOIDEA

Family BOLITAENIDAE

Genus *Japetella* Hoyle

1885. *Japetella* Hoyle. *Ann. Mag. Nat. Hist.* (5), **15** : 222.

166. *Japetella* sp.

Diagnosis : Hectocotylus with several enlarged suckers.

Locality : Manipur, Ukhrul District, Tulloi.

Geological horizon : Cretaceous to Recent.

Remarks : Mitra *et al.* (1986) recorded *Bolitaenella* from Tulloi which is now regarded as a synonym of *Japetella*.

TRACE FOSSILS

Cosmorhape Fuchs

1895. *Cosmorhape* Fuchs, *Akad. Wiss. Wien, math.-naturwiss. Kl., Denkschr.*, **62** : 369-448.

Diagnosis : 'Free meanders' of extraordinarily regular form in two size orders; windings not close to each other; form reminiscent of some spawn-strings of Gastropods.

Locality : Manipur, Ukhrul District, South of Paoyi

Geological horizon : Cretaceous to Lower Tertiary.

Ophiomorpha Lundgren, 1891

Diagnosis : Tunnel trails with tubercle-like or wart-like ornamentation of outer wall but smooth

inside; width 1-2 cm.; sometimes branched with place of ramification widened in blistered or pear-shaped way.

Locality : Manipur, Bishenpur District, nr. Limatak.

Geological horizon : Upper Cretaceous to Tertiary.

CALCAREOUS NANNOFOSSILS

A rich assemblage of Coccoliths is also noticed in the ophiolite belt in Ukhrul District. Chungkham & Jafar (1998) recorded the following calcareous nannofossils from the pelagic limestones of Manipur ophiolite belt :

Arkhangelskiella cymbiformis Vekshina

Aspidolithus parvus constrictus (Hattner *et al.*)

Ceratolithoides aculeus (Stradner)

Cretarhabdus crenulatus Bramlette & Martini

Cribracorona gallica (Stradner)

Cribrospaerella ehrenbergii (Arkhangelsky)

Eiffellithus eximius (Stover)

Eiffellithus turrisseiffellii (Deflandre & Fert)

Lithraphidites carniolensis serratus Shumenko

Manivitella pemmatoidea (Deflandre)

Micula murus (Martini)

Micula praemurus (Burky)

Micula swastika Stradner & Steinmetz

Micula sp.

Parhabdolithus embergeri (Noël)

Prediscosphaera cretacea (Arkhangelsky)

Prediscosphaera sp.

Quadrum gothicum (Deflandre)

Quadrum trifidum (Stradner)

Reinhardtites anthophorus (Deflandre)

Watznaueria barnesae (Black)

Zygodiscus diplogrammus (Deflandre & Fert)

Zygodiscus spiralis Bramlette & Martini

DISCUSSION

The rock types observed in the eastern hills of the Manipur State consist mainly of sandstone and shale siltstone geosynclinal flysches with minor bands of greywacke. These flysches showed the presence of irregular blocks of limestone, conglomerate, calcareous sandstone, greywacke, serpentinite and chert. These sediments to the east were further tectonically overlain by a host of gabbro-ultrabasics to basics ranging from serpentinite peridotite, basic volcanics and diorite. The limestones etc. were referred to as Cretaceous bed by the earlier workers (Oldham, 1883; Pascoe, 1912; Raina, 1959) or Ukhrul bed (Nandy & Sriram, 1970; Ghosal, 1972). The slightly metamorphosed sandstone and shale-siltstone flysches were classified by the earlier workers as the 'Disang Series' (Oldham, 1883; Pascoe, 1912; Raina, 1959; Nandy & Sriram, 1970; Ghosal, 1973). The basics-ultrabasics were clubbed under 'Serpentine beds' by the previous workers who considered these rocks as intrusives (Oldham, 1883; Pascoe, 1912; Raina, 1959; Nandy *et al.*, 1970; Ghosal, 1972). Observations made by Bhattacharya & Bhattacharya (1984) revealed that the 'Disang Group' (noted earlier as 'Series') exhibited considerable variation in rock assemblage from west to east and could be compartmented into a sandstone flysch (Lamlang Formation) overlain by a shale-siltstone flysch (Ukhrul Formation). The contact between these two flysches was perhaps tectonic one. It was also noted by them that the irregular exposures of limestone, conglomerate, calcareous sandstone, greywacke and basic ultrabasic etc., located in this area within the sandstone and shale siltstone flysches were rootless exotic blocks. Presence of the exotic blocks were more widespread within the shale-siltstone flysch (Ukhrul Formation) than the sandstone flysch (Lamlang Formation). It was also observed by them (*loc. cit.*) that the ultrabasic-basics (Sirohi Formation), exposed to the east overlying the Ukhrul Formation, was tectonically emplaced body.

Bhattacharya & Bhattacharya (1984) opined that the limestone occurrences of Manipur East were of Cretaceous (Maestrichtian) age. This opinion was strengthened by the perusal of the palaeontological data. Besides, the limestone exotics, other rock types occurring as rootless floaters were conglomerate, greywacke, calcareous sandstone, serpentinite, radiolarite etc. Their study indicated that the limestone of Manipur, part of the Indo-Myanmar orogene were like those of the contiguous Chin Hills, Arakan-Yoma and coastal Myanmar.

The 'Disang Formation' restricted to the east of the 'Haflong-Disang Thrust' may be correlated with their homotaxial equivalents *viz.*, Sylhet limestone – Kopili beds. (Mitra *et al.*, 1986). There is a general agreement of opinions (Evans, 1932; Mathur & Evans, 1964) that the age limit of the base of the 'Disang Formation' may be extended down to Cretaceous. Ranga Rao (1983) allocated the limestone bearing rocks of Disangs a Lower Disang status with Maestrichtian age. The Olistostromal deposits were confined to upper part of the Disang Formation.

Prithiraj *et al.* (1992) referred a Late Campanian age for the Hundung North limestones and a Late Maestrichtian age for the Mova samples on the basis of their study of planktonic microfossils. They indicated a deep water oceanic depositional condition and a slow rate of net sediment accumulation.

Prithiraj & Jafar (1998) suggested that the initial rifting and creation of the Indo-Myanmar Ocean took place before Late Santonian time. The initiation of the suturing process (subduction/obduction) leading to the disruption of the ocean floor took place by Latest Maestrichtian.

On the basis of study of fossil planktonic foraminiferal association of two distant parts of the Tethys Ocean (*viz.*, Semsales wildflysch zone, Switzerland and Ukhrul Melange zone, India). Prithiraj & Caron (1996) stated that, at the very end of the Maestrichtian age these two distant parts of the Tethys Ocean had a similar environment. They suggested a stable, and

homogenous global oceanic conditions prevailed just before the onset of the strong perturbations at the Cretaceous/Tertiary boundary.

SUMMARY

The State of Manipur, situated in the northeastern part of India and covering an area of about 22,329 sq. km., forms a part of the Naga-Arakan Yoma highland. This region was a part of the Tethys Sea in the Archaean period. During the Palaeozoic and much of the Mesozoic eras, the sea continued to receive sediments of conglomerates, shales, sandstones and limestones of the Archaean rocks. Repeated orogenic movements accompanied by extensive igneous intrusions occurred in the successive periods that influenced the geologic and tectonic alignments of the region. The rock formations occurring in Manipur comprise the Cretaceous limestones, the Disang with serpentinites (Lower and Middle Eocene – Upper Cretaceous), the Barails (Upper Eocene and Oligocene), the Surmas and the Tipams (Miocene). A number of fossil beds are exposed especially, along the eastern part of the State. The exploration and updating of records of animal fossils of this area were conducted as a part of the programme of preparation of exhaustive faunal account of the State of Manipur by the ZSI.

Altogether 167 species of animal fossils, 2 trace fossils and 23 species of calcareous nannofossils have been recorded, viz., 68 species of Protozoa : Foraminifera, 34 species of Protozoa : Radiolaria, 4 species of Coelenterata, 3 species of Bryozoa, 5 species of Arthropoda : Crustacea, 37 species of Mollusca : Bivalvia and 16 species of Mollusca : Gastropoda. The assemblage of microfauna of ophiolite belt of Ukhrul area was referred to a Late Cretaceous age, while the fauna

associated with the exotic blocks were of varying age from Palaeocene to Upper Eocene.

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REFERENCES

- ACHARYYA, S.K., ROY, D.K. AND MITRA, N.D. 1986. Stratigraphy and Palaeontology of the Naga Hills Ophiolite Belt., In : Geology of Nagaland Ophiolite. *Mem. Geol. Surv. Ind.*, **119** : 64-74.
- ALWAR, M.A. AND BANERJEE, S., 1963. Geochemical prospecting for nickel over the serpentinite in the Moreh area, Manipur. *Min. Res. Div. Sr. No. 21, United Nations*, New York, pp. 161-164.
- ALWAR, M.A., BANERJEE, S. AND DAYAL, B. 1961. Investigation of Nickel and Copper mineralisation in the Moreh area, Manipur State. Prog. Rep. for F.S. 1960-61, Geological Survey of India (unpublished).
- BHATTACHARYA, A.C. 1973. Investigation on Lignite in Kngvoi area, Manipur. Draft Prog. Rep. For F.S. 1972-73, Geological Survey of India.
- BHATTACHARYA, U. AND BHATTACHARYA, A. 1984. Stratigraphy and Palaeontology of Upper Cretaceous rocks of Eastern parts of Manipur. Prog. Rep. for F.S. 1975-76, Geological Survey of India (unpublished).
- BHATTACHARYA, A. AND BHATTACHARYA, U. 1987. Review of the Stratigraphy and Palaeontology of Upper Cretaceous sediments of Northeastern India. In : *Three Decades of Developments in Palaeontology and Stratigraphy in India*. 1 (Precambrian to Mesozoic), Spl. Publ. No. 11, Geol. Surv. India, Hyderabad; : 367-387.
- BISWAS, B. 1962. Stratigraphy of the Mahadeo, Langpar-Cherra and Tura Formations, Assam, India. *Bull. Min. Met. Soc. Ind.*, **25** : 1-48, pls. 1-13.
- BRUNNSCHWEILER, R.O. 1966. On the geology of Indo-Burma Ranges. *J. Geol. Soc. Aust.*, **13** : 137-194.
- BRUNNSCHWEILER, R.O. 1974. *Indo-Burma Ranges. Mesozoic-Cenozoic Belt*. Joolish Academic Press for Geological Society, London.
- CHAKRABORTY, S. AND RAINA, V.K. 1959. Progress Report (Unpublished), Geological Survey of India.
- CHATTOPADHYAY, B. AND ROY, R.K. 1975. Systematic geological mapping and preliminary mineral investigations in parts of Ultramafic belt in Manipur East District, Manipur. Progress Report, F.S. 1974-75, Geological Survey of India (unpublished).
- CHUNGKHAM, PRITHIRAJ AND CARON, M. 1996. Comparative study of a Late Maastrichtian (*A. mayaroensis* zone) foraminiferal assemblage from two distant parts of the Tethys Ocean : Semsales Wildflysch Zone, Switzerland and Ukhrul Melange Zone, India. *Rev. Palaeobiol.* **15**(2) : 499-517.
- CHUNGKHAM, PRITHIRAJ AND JAFAR, S.A. 1998. Late Cretaceous (Santonian –Maastrichtian) integrated Coccolith –Globotruncanid biostratigraphy of pelagic limestone from the accretionary prism of Manipur, northeastern India. *Micropaleontology*, **44**(1) : 69-83.
- CHUNGKHAM, PRITHIRAJ, MISHRA P.K. AND SAHNI, A. 1992. Late and terminal Cretaceous foraminiferal assemblages from Ukhrul, Mélange Zone, Manipur. *Curr. Sci.* **62**(6) : 479-481.
- CLEGG, E.L.G. 1938. The Geology of parts of Minbu and Thafatmye Districts, Burma. *Mem. Geol. Surv. Ind.* **72**. pt. 2.
- DAYAL, B. AND DUARA, B.K. 1963. Report on the systematic geological mapping and mineral survey in parts of Manipur State. Progress Report for the F.S. 1962-63, Geological Survey of India (unpublished).

- DUTT, G.N. 1959. A preliminary note on the Nickel mineralisation at Kwatha and Nampesha-Huimine areas, Manipur State. Progress Report for the F.S. 1958-59, Geological Survey of India (unpublished).
- EVANS, P. 1932. Tertiary succession in Assam. *Trans. Min. G.M.I.* **27**, pt. 3 : 155-260.
- GSI, 1974. Geology and Mineral Resources of the States of India. Pt. IV. Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. Misc. Publ. No. 30 ; 124 pp.
- GSI (ANONYMOUS), 1985. *GSI, NER Newsletter*, **4** (1&2).
- GSI (ANONYMOUS) 1987. Megafossils from Diasang in Manipur. *GSI, NER Newsletter*, **6**.
- GHOSH, S., CHATTOPADHYAY, B., ROY, D.K. AND VENKATRAMANA, P. 1984. On Radiolaria – bearing rocks of Naga Hills Ophiolite. *Rec. Geol. Surv. Ind.* **113** (4) : 89-97.
- GHOSAL, A.K. 1972. Detailed investigation of limestone around Ukhrul, Manipur East. Prog. Rep. for F.S. 1970-71, Geological Survey of India (unpublished).
- GHOSAL, A.K. 1976. A note on the stratigraphy and tectonics of Ukhrul beds. (Abstract). *N.E. Himalayan Geology Seminar*, Shillong.
- KHAN, S.A. AND GUPTA, K.S. 1990. Hand-out of the geological excursion: Imphal-Lambui-Singcha Section. National Seminar on Tectonic and Metallogeny of ophiolite and recent advances in geology of north-eastern India. 3-6 March, p. 1.
- KHAN, S.A., RAO, N.K. AND MISHRA, U.K. 1988. Mega and Microbiota from Disang in Manipur. *GSI, NER Newsletter*, **7**.
- MALLET, F.R. 1876. On the coal fields of Naga Hills bordering the Lakhimpur, Sibsagar districts, Assam. *Mem. Geol. Surv. Ind.* **12**, pt. 2.
- MATHUR, L.P. AND EVANS, P. 1964. Oil in India. 22nd *Internatl. Geol. Cong.* 86 pp.
- MISHRA, U.K. 1990. Palaeontological study of the Disang – Barail sediments and ophiolite suite of rocks in parts of Manipur East and Chandel Districts, Manipur. *Rec. Geol. Surv. India*, **123** (4) : 165-166.
- MISHRA, U.K. 1991. Palaeontological study of the Disang-Barail sediments and ophiolite suite of rocks in parts of Ukhrul, Churachandpur and Bishenpur Districts, Manipur. *Rec. Geol. Surv. India*, **124** (4) : 223-224.
- MISHRA, U.K. 1993. Updating and compilation of Palaeontological data on mega and microbiota of the ophiolite belt and adjoining Disang and Barail sediments, Manipur. *Rec. Geol. Surv. India*, **126** (4) : 125-129.
- MITRA, N.D., VIDYADHARAN, K.T., GAUR, N.P., SINGH, S.K., MISHRA, U.K., JOSHI, A., KHAN, I.K. AND GHOSH, S. 1986. A note on the Olistotromal deposits of Manipur. *Rec. Geol. Surv. India*, **114** (4) : 61-76.
- NANDY, D.R. AND SRIRAM, K. 1970. Report on the investigation of limestone deposits in the Ukhrul District, Manipur. Prog. Rep. for the F.S. 1969-70, Geological Survey of India.
- OLDHAM, R.D. 1883. Report on the geology of the Manipur State and Naga Hills. *Mem. Geol. Surv. Ind.* **19**, pt. 4 : 219-292.
- PASCOE, E.H. 1912. Traverse across from Dimapur to neighbourhood of Sarameti peak. *Rec. Geol. Surv. Ind.* **42**(4) : 261 p.

- PASCOE, E.H. 1950. *A Manual of Geology of India and Burma*. 3, Govt. of India Press, Calcutta.
- RAINA, V.K. 1959. Report on the preliminary investigation of limestone of Manipur State. Prog. Rep. for F.S. 1958-59, Geological Survey of India (unpublished).
- ROY, D.K. 1980. Radiolaria in Manipur Ophiolite. *Geol. Surv. Ind. News*.
- RANGA RAO, A. 1983. Geology and Hydrocarbon potential of a part of Assam – Arakan basin and its adjacent region. *Petrol. Asia Jour.* 4 (4) : 127-158.
- SATSANGI, P.P. AND CHATTERJEE, B.P. 1979. Progress Report for F.S. 1977-78, Geological Survey of India (unpublished).
- SAXENA, S.P. 1987. Some observations on the lithostratigraphy of the 'Barail Group' in Nagaland, Manipur and Upper Assam and suggestion for regrouping. *Rec. Geol. Surv. India*, 115 (3&4) : 75-84.
- SINHA, N.K., CHATTERJEE, B.P. AND SATSANGI, P.P. 1982. Status of palaeontological researches in Northeastern India. *Rec. Geol. Surv. India*, 112 (4) : 66-88.
- SRIRAM, K AND MUKHOPADHYAY, R.N. 1971. A report on the geological mapping of parts of Ukhrul District, Manipur. Prog. Rep. for F.S. 1970-71, Geological Survey of India (unpublished).
- SRIRAM, K., MUKHERJEE, R.N. AND RAPA, D.A. 1972. Report on the geological mapping of a part of Ukhrul District, Manipur. Prog. Rep. for F.S. 1971-72, Geological Survey of India (unpublished).
- THEOBALD, W. 1872. The axial group in Western Prome British Burma. *Rec. Geol. Surv. India*, 4, pt. 2.



Plate I : A. Imphal Valley seen from Hills.



Plate I : B. A view of Loktak lake.



Plate II : A. General feature of hills of Manipur, viewed from Ukhrul.



Plate II : B. Fossiliferous hills of Thoubal District.

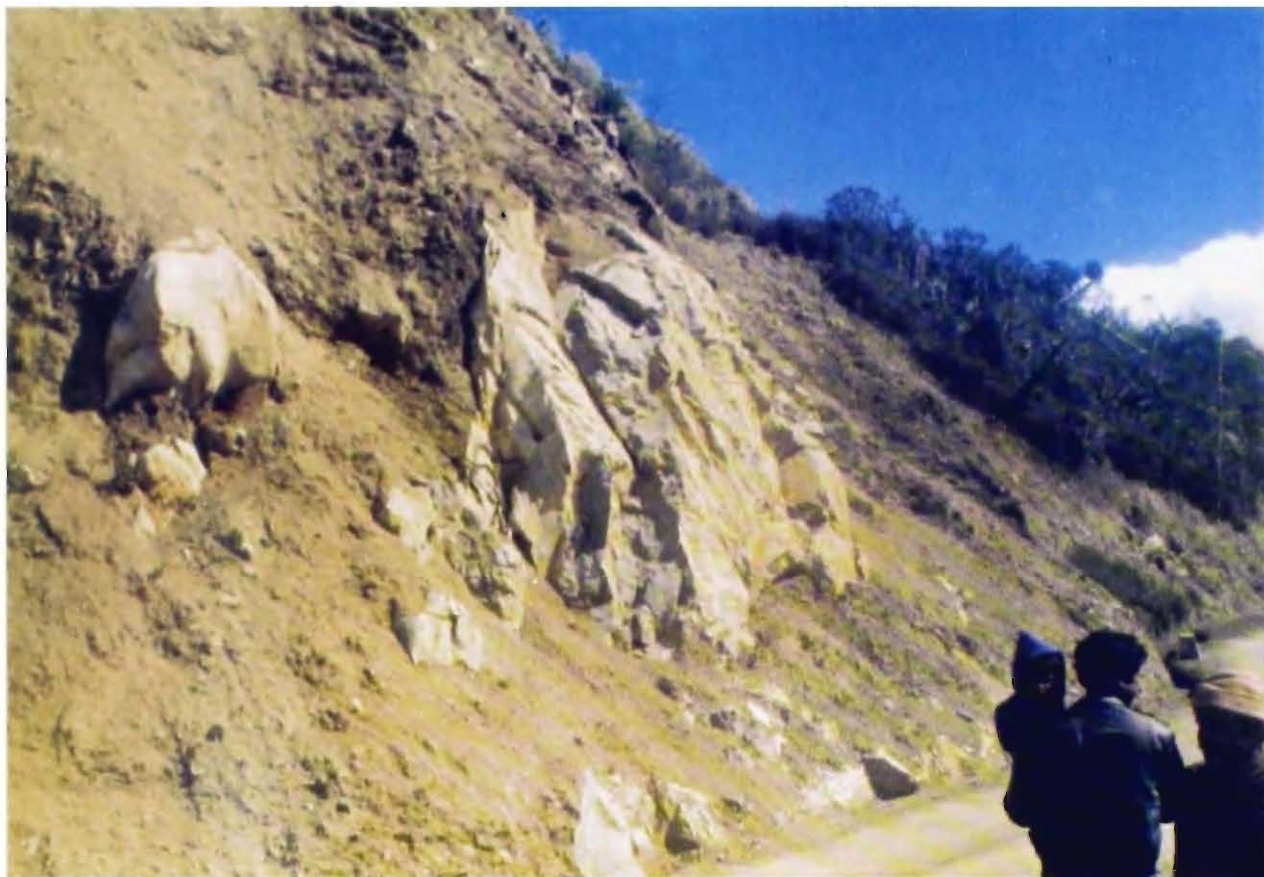


Plate III. A. Exotic limestone of Chandel District.



Plate III. B. Conglomerate near Ukhrul.



Plate IV. A. Limestone deposit near Viewland Bazar, Ukhrul; Courtesy : Dr. N. Ibotombi.



Plate IV. B. Hundung North Carbonate deposits; Courtesy : Dr. N. Ibotombi.



Plate V. A. Kangkhui limestone cave; Courtesy : Dr. N. Ibotombi.

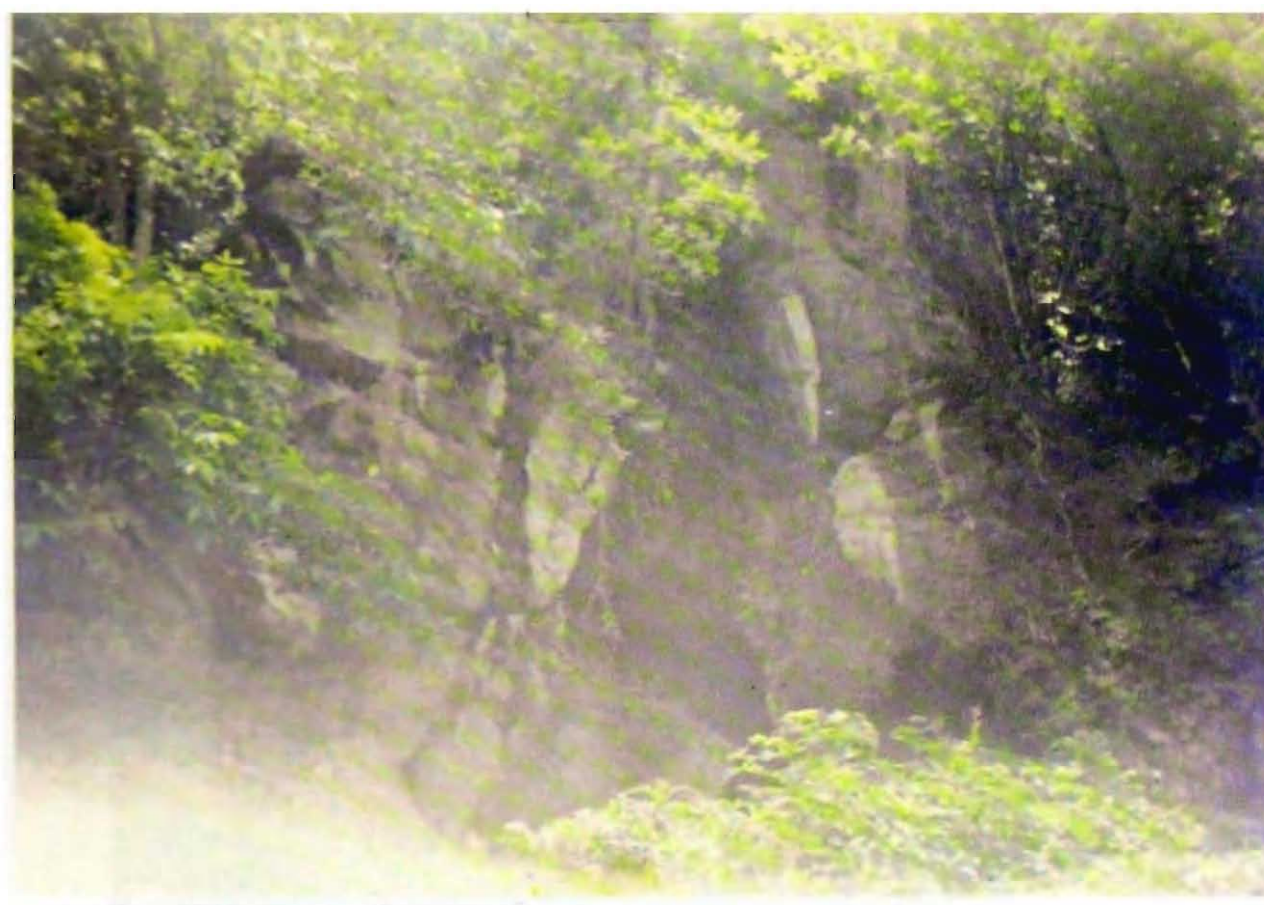


Plate V. B. Kankhui limestone cave; Courtesy : Dr. N. Ibotombi.



Plate VI. A. Carbonate deposits near Nwongsankhong, Ukhrul; Courtesy : Dr. N. Ibotombi.



Plate VI. B. Carbonate deposits near 6th Manipur Rifles, Ukhrul; Courtesy : Dr. N. Ibotombi.



Plate VII. A. Carbonate deposits near I.B., Ukhrlu; Courtesy : Dr. N. Ibotombi.



Plate VII. B. Mova limestone deposits near Cement Factory; Courtesy : Dr. N. Ibotombi.



Plate VIII. A. Ukhrul Cement Factory in the background of Carbonate deposits in hills; Courtesy : Dr. N. Ibotombi.

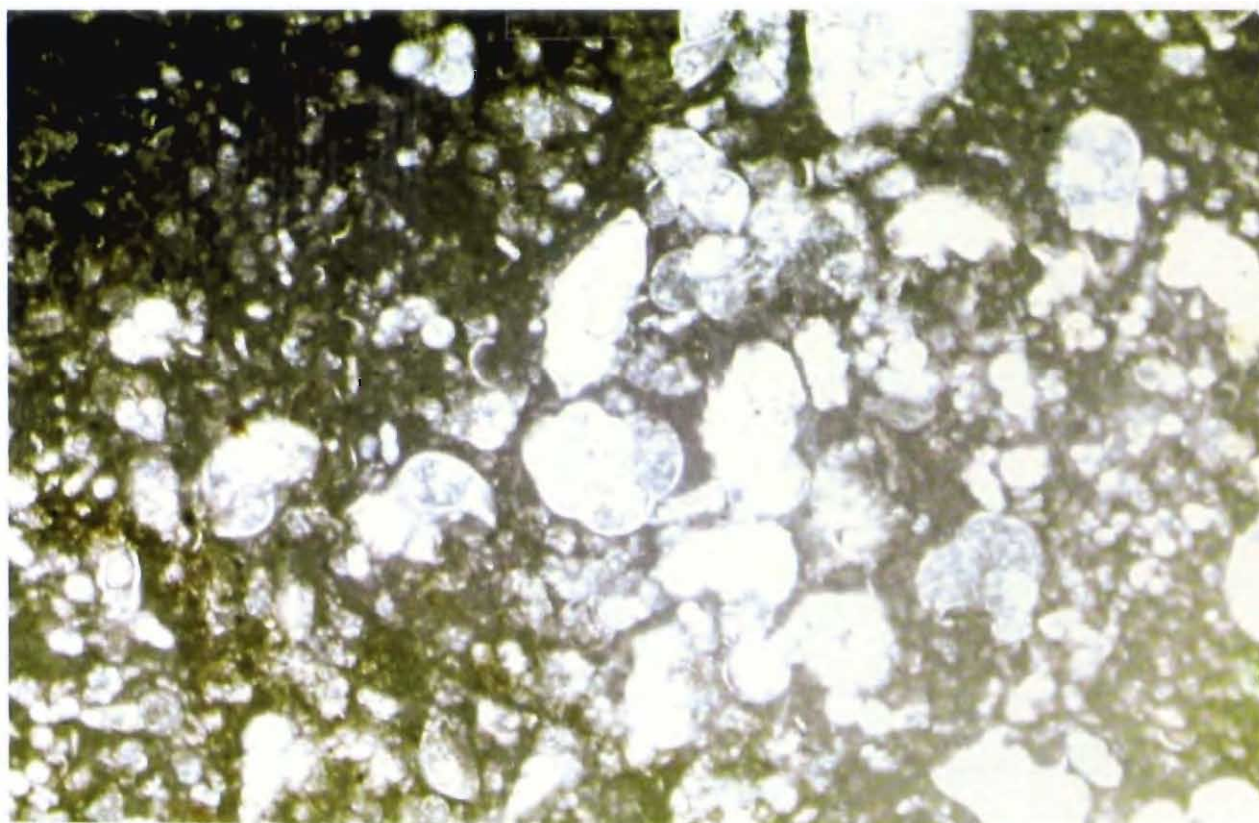


Plate VIII. B. 2. Micrograph of *Globotuncana falsostuarti* in thin section of limestone; Courtesy : Dr. N. Ibotombi.

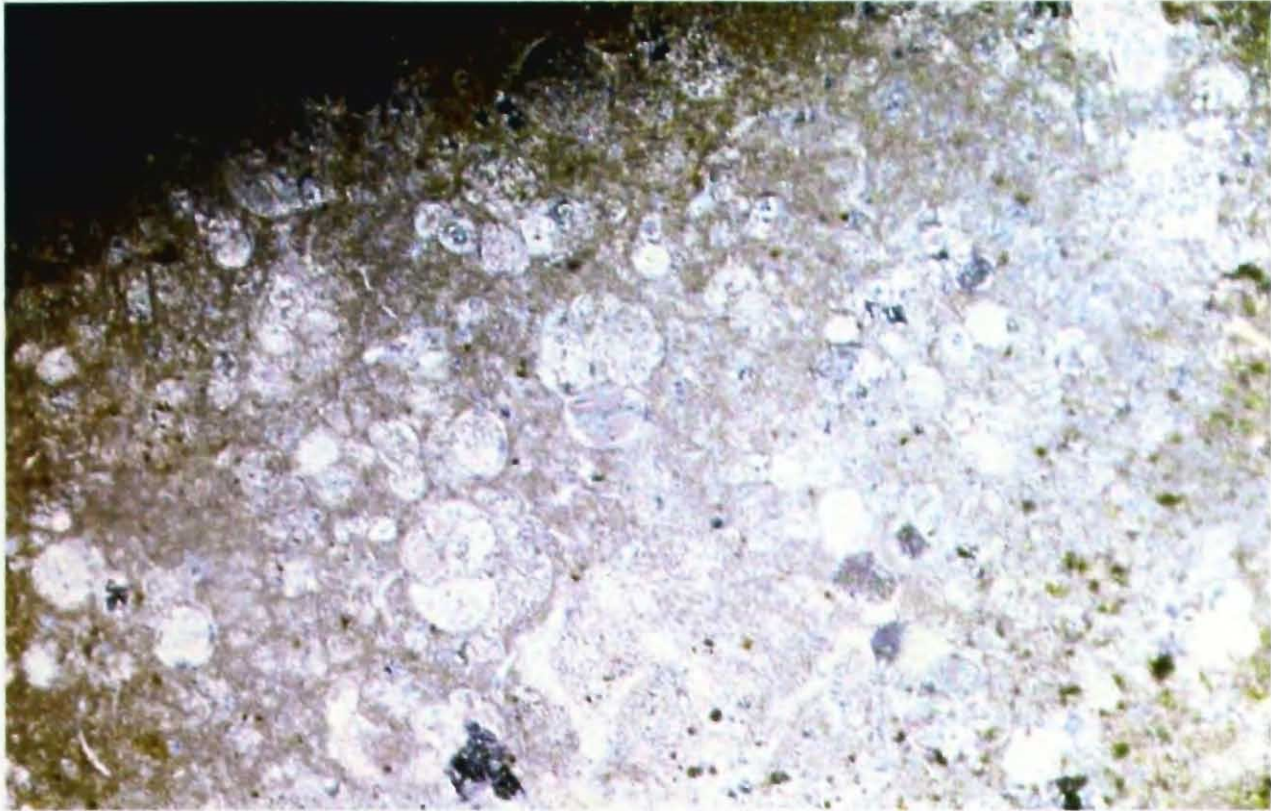


Plate IX. A. Micrograph of microfossils in thin section of limestone; Courtesy : Dr. N. Ibotombi.



Plate IX. B. Fossil molluscs in Upper Disang rock of Ukhrul District; *Cardium* sp.



Plate X. A. Fossil molluscs in Upper Disang rock of Ukhrul District; *Mytilus* sp., *Turritella* sp., *Neptunea* sp.



Plate X. B. Fossil mollusc in Upper Disang rock of Ukhrul District; *Solariella* sp.



Plate XI. A. Fossil molluscs in Upper Disang rock of Ukhrul District; *Natica* sp.

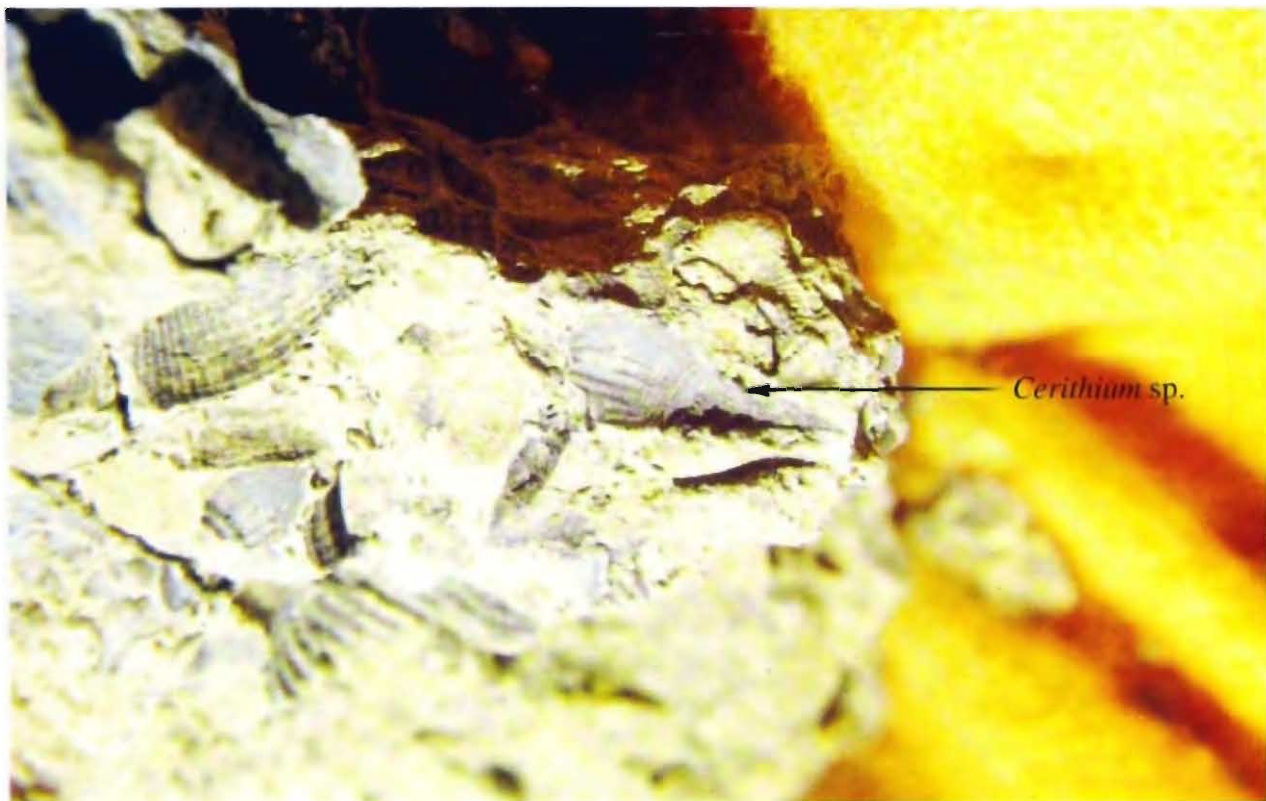


Plate XI. B. Fossil molluscs in Upper Disang rock of Ukhrul District; *Cerithium* sp.



Plate XII. A. Fossil molluscs in Upper Disang rock of Ukhul District; *Helcion* sp.



Plate XII. B. Fossil molluscs in Upper Disang rock of Ukhul District; tunnelled impression of *Helcion* sp.